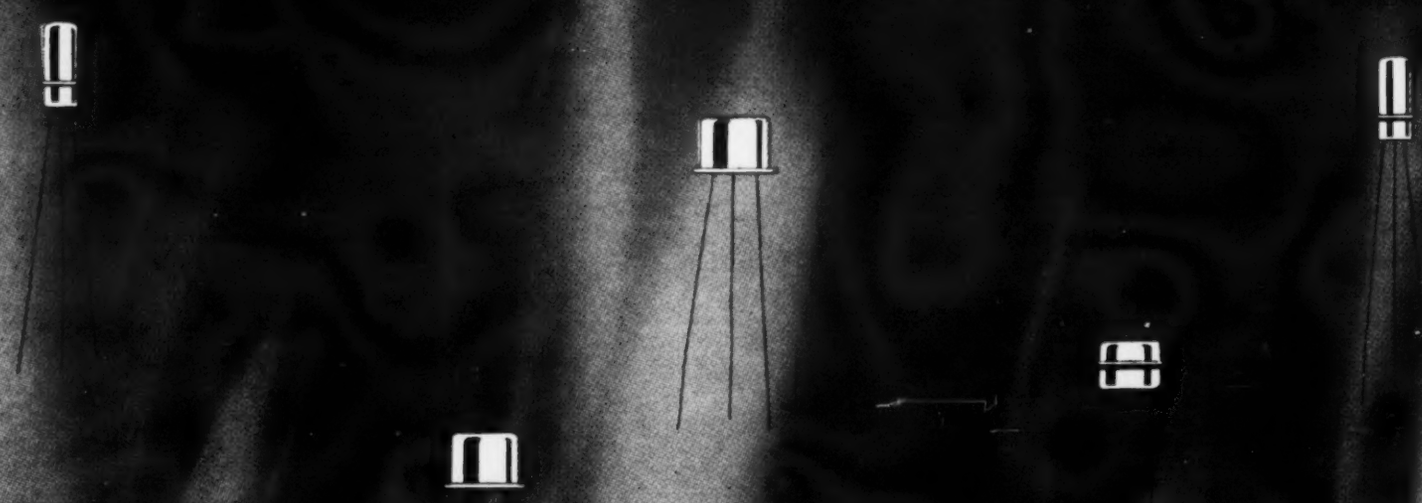
SIGNAL

December 1959

in SILICON transistors ...the "HOT" Line is PHILCO



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Philco's full range of silicon high speed switching transistors, in both PNP and NPN types, provides the designer with a wide choice to meet the requirements of all high temperature applications. They are engineered and specified to permit simple, straightforward design of practical circuits up to 5 mc pulse rates, using saturated configurations and up to 30 mc pulse rates with non-saturating techniques. Packaged in TO-1, TO-5 and TO-9 cases.

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Philco amplifying transistors are available in nine types, covering the complete high frequency range. The designer will find both PNP and NPN types that permit the design of communications systems at frequencies up to 60 mc. They have low collector capacitance and are available with restricted beta ranges to simplify design problems. All offer excellent performance at junction temperatures up to +140°C. Packaged in TO-1, TO-5 and TO-9 cases.

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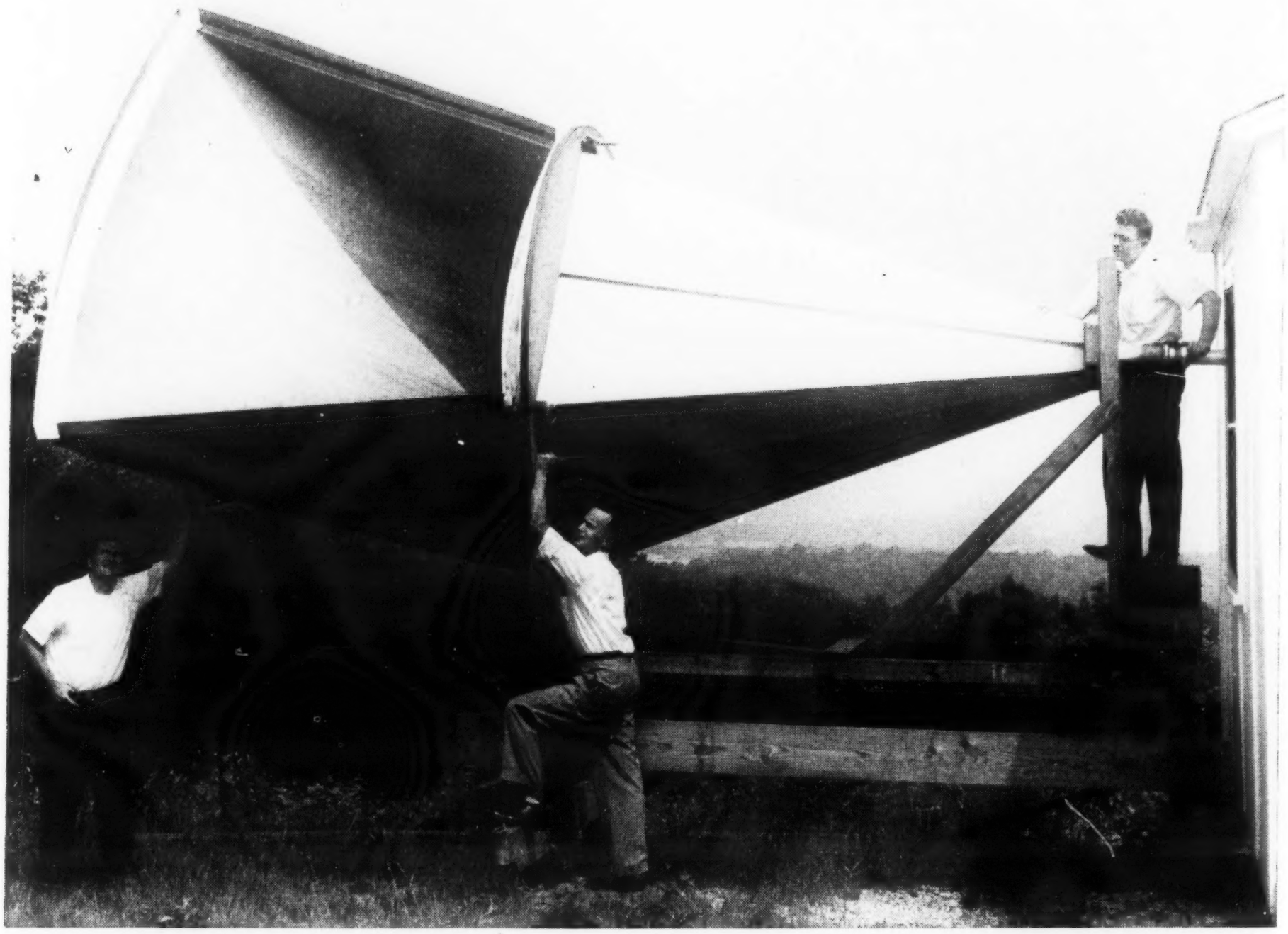


At Bell Laboratories, Holmdel, N. J., a horn reflector antenna is beamed skyward by scientists Edward Ohm, David Hogg and Robert DeGrasse. The maser amplifier, which employs a ruby cooled in liquid helium, is inside building at right. Over-all "noise" temperature of antenna, amplifier and sky is only 18°K at 5600 megacycles.

ANOTHER STEP TOWARD SPACE COMMUNICATIONS

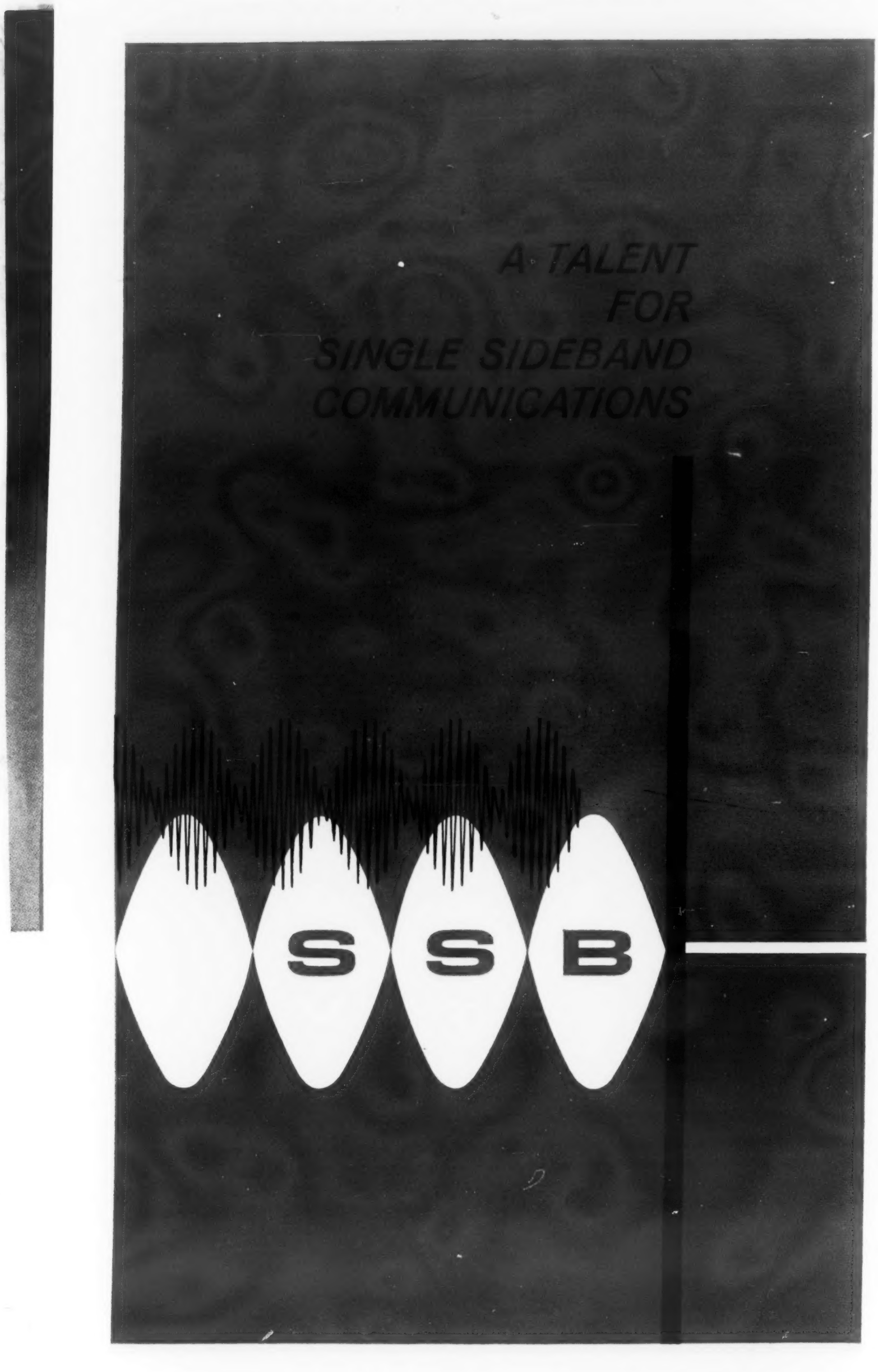
The above antenna is part of a new ultra-sensitive radio receiving system under development at Bell Telephone Laboratories. It has extraordinary directivity. Beamed skyward, it ignores radio "noise" from the earth, yet picks up extremely weak signals from outer space.

The signals are amplified by the latest Bell Laboratories "maser" amplifier. The maser principle was first demonstrated, using gas, by Prof. C. H. Townes and his collaborators at Columbia University. Bell Laboratories scientists applied it to the solid state guided by a theoretical proposal of Prof. N. Bloembergen of Harvard University. Their latest traveling wave maser amplifier employs a ruby mounted in a waveguide. The ruby is excited to store energy. As signals pass through, they absorb this energy and are thus amplified. The device uniquely combines the characteristics needed for practical space communication: extremely low inherent noise and the ability to amplify a broad frequency band.

At present the receiving system is being used to pick up and measure minute radio noise generated by the atmosphere. It also foreshadows important advances in long distance communications. For example, it could extend the range of space-probe telemetering systems, could help make possible the transatlantic transmission of telephone and TV signals by bouncing them off balloon satellites—and has numerous applications in radio astronomy and radar.

This pioneer development in radio reception is one more example of the role the Bell System plays in the pursuit of better communications technology.

BELL TELEPHONE SYSTEM



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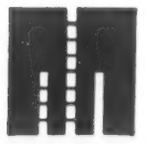

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BPA

SIGNAL

Communications-Electronics-Photography

Journal of the Armed Forces Communications and Electronics Association

VOLUME XIV DECEMBER 1959 NUMBER 4

CONTENTS

Cover

SIGNAL's cover is a tribute to the 10th anniversary of the North Atlantic Treaty Organization which, since its foundation, has been instrumental in maintaining world peace. Chief among its many accomplishments was the establishment of an international communications system for both military and civilian usage (as illustrated by the small photos, upper right—Naples, Italy installation by Page Communications Engineers, Inc. of the United States, lower left—SHAPE Headquarters in Paris, France). See page 6.

DEPARTMENTS

Authors are entirely responsible for opinions expressed in articles appearing in AFCEA publications, and these opinions are not to be construed as official or reflecting the views of the Armed Forces Communications and Electronics Association.

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Dear Member:
I am sure you will agree with me that we have much in common, especially when it comes to a selection of a Christmas gift for a friend. Because of our daily activities and other bona fide reasons, we invariably delay our shopping until a few days before Christmas. Then the question arises: Have we remembered everyone we should remember and/or have we selected an appropriate gift? As far as the immediate family is concerned this presents no problem. However, that important business contact, that friend in industry or military service, that outstanding employee in your plant and that "Ham" operator, engineer, student or that communications-electronics and photography enthusiast, to name a few, may very well have slipped your mind. Maybe you will remember everyone but the odds are that you may forget someone during those few hectic days before Christmas.
This year let us help you by suggesting that you give SIGNAL magazine as a Christmas gift. In doing so you will perform a double service—a meaningful gift to a friend—a service to AFCEA by increasing the circulation of your Association's journal.

W. J. Baird, General Manager & Editor

★ ★ ★ ★

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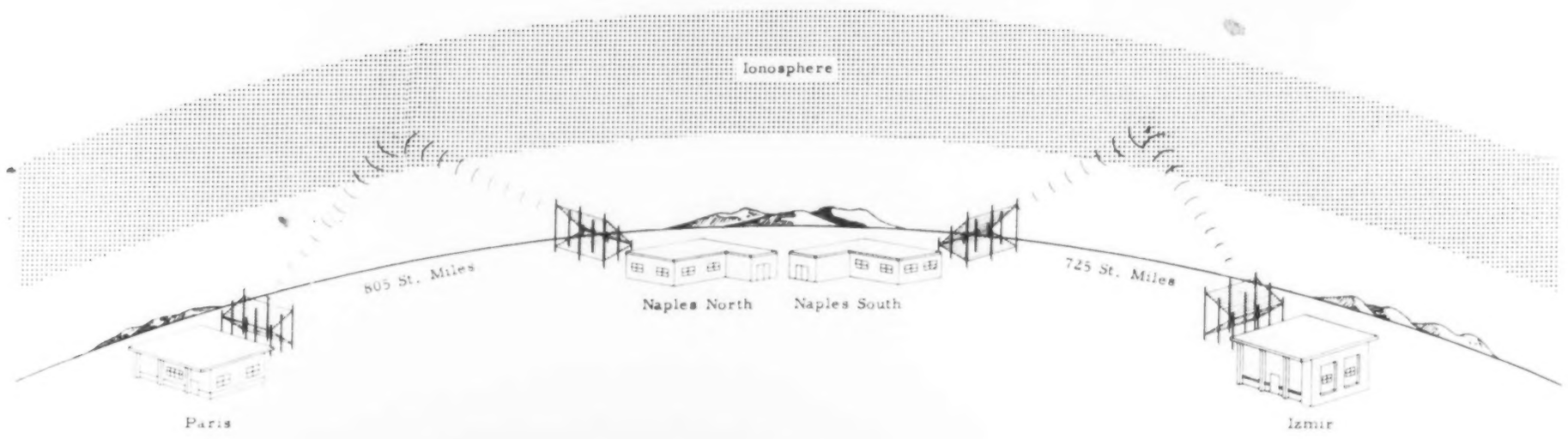
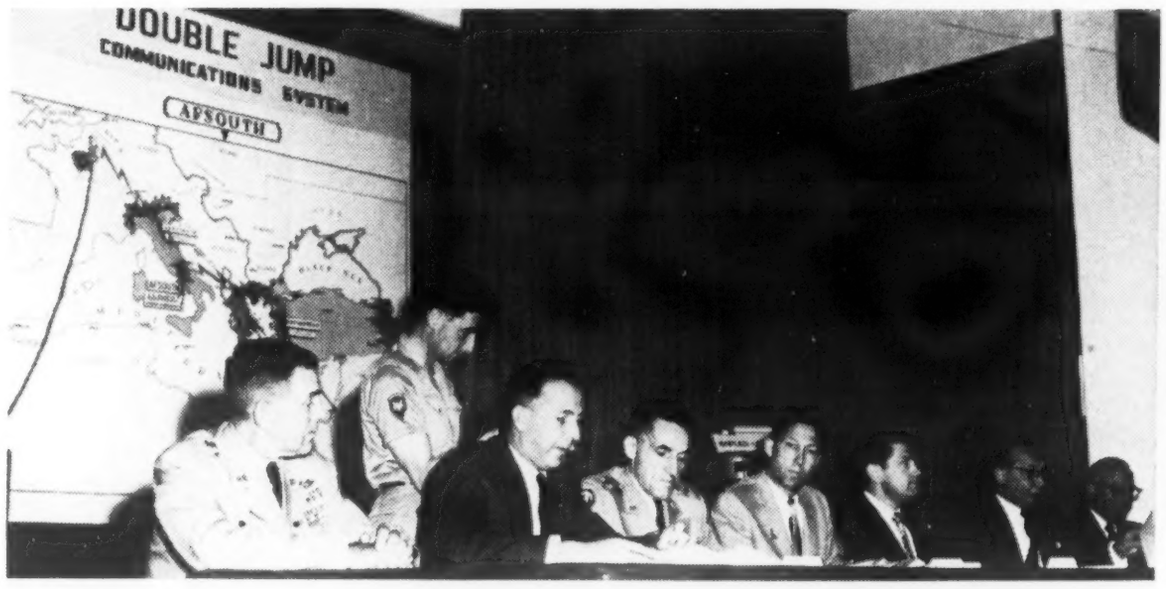
★ ★ ★ ★

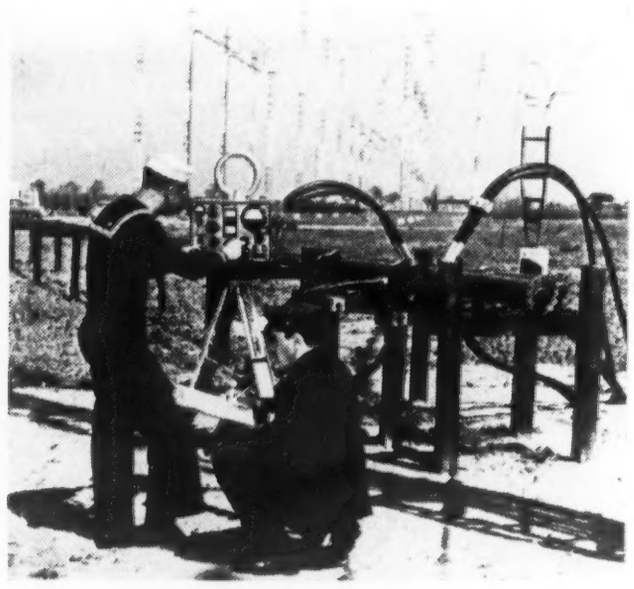
Merry Christmas

Our National Directors and Officers are joined by National Headquarters, AFCEA, in extending Season's Greetings to all our Individual Members, Sustaining and Group Member Companies and our Advertisers in SIGNAL.

THE FOLLOWING ARTICLES, SHAPE COMMUNICATIONS BY MAJ. GEN. VICTOR A. CONRAD, USA, CHIEF SIGNAL OFFICER, SHAPE, AND NATO'S "DOUBLE JUMP" NETWORK BY ESTERLY C. PAGE, PRESIDENT, PAGE COMMUNICATIONS ENGINEERS, INC., A SUBSIDIARY OF NORTHROP CORP., DISCUSS THE DEVELOPMENT OF THE NEW DOUBLE JUMP PROJECT AND HOW THE PROJECT FITS IN AS AN INTEGRAL PART OF THE SHAPE COMMUNICATIONS SYSTEM.







GENERAL CONRAD:

HISTORICALLY, GOOD communications have been one of the primary requisites for a successful military organization. To a defensive alliance, such as the North Atlantic Treaty Organization (NATO), whose life is based upon a retaliatory strategy, a widespread network of reliable communications facilities which permits almost instantaneous communications between various echelons of command is vital. The communications for Allied Command Europe have not always been adequate—when Supreme Headquarters Allied Powers Europe (SHAPE) was activated in 1951 it often took hours to complete a call to some of the more distant headquarters. Now, as the result of nearly a decade of hard work, difficult planning, and outstanding international cooperation as well as a substantial financial investment, SHAPE rapidly is achieving its necessary communications capability.

SHAPE's communications are based upon the widespread post-telephone-telegraph (PTT) systems of the NATO countries, supplemented by the modern ionospheric and tropospheric scatter systems which presently are being installed. In establishing an adequate communications net, the first step was to assist the PTT's to develop and increase their facilities from which the means of military communications would be drawn. A comprehensive program was developed which, when the remaining projects are completed, will include installment of more than twenty-five thousand miles of landlines, radio links and submarine cables—an investment of almost a half billion dollars—from international funds contributed by the fifteen NATO nations.

As the original program was being carried out, new technological developments presented the possibility of providing an all-military system to supplement the commercially available facilities. Also, the speed of modern firepower delivery systems—aircraft and missiles—increased the requirement for modern communications to supplement the early warning net.

The forward scatter technique first was put to practical use in America in 1953 and the first American link placed in operation the following year. Even as development of the technique proceeded, SHAPE prepared and submitted to the North Atlantic Council a plan for a military system in Allied Command Europe. This plan was approved in mid-1956. So that we could gain experience as quickly as possible on such circuits in Europe, it was decided to build a three-hop tropospheric scatter test system in Norway—planned so that the Norwegian link would become a part of the complete SHAPE system upon its completion. The SHAPE Air Defense Technical Center (SADTC), The Hague, Netherlands, was given responsibility for establishing the test system. Contracts were made by SADTC with consultants and equipment suppliers as well as with the Norwegian Defense Research Establishment for construction of works as well as daily operation of the installations when completed. To understand the urgency with which the program was developed and the rapidity of progress one need only glance at the schedule accomplished: the Norwegian parliament sanctioned the project at the end of May 1956, construction work commenced on 2 stations — Oslo and Trondheim — in July 1956 and by early 1957 they were ready for installation of the radio equipment. The entire four-station-link had been completed and given a comprehensive test when it was turned over to SHAPE for operational control in August 1958.

Known as Project DOUBLE JUMP, the second step in the overall system was completed when an ionospheric scatter link was completed early in 1959 to connect SHAPE with its subordinate headquarters in Naples and Izmir—a 1600 mile link. Both the Norwegian and the SHAPE-Naples-Izmir links were completed under a special arrangement which differs from the rest of the system. The SHAPE Air Defense Technical Center was in charge of implementing the plans while the host countries furnished the location sites and contracted for the buildings and physical facilities. The U.S.A. underwrote the costs in order to get the systems in operation as quickly as possible.

The DOUBLE JUMP Ionospheric Forward Scatter System exemplifies the application of modern technology to the military communication requirements of today. Superbly engineered and thoroughly tested, this system, through the scatter technique, provides communications approaching a reliability of one hundred percent.

It is significant to note that these ionospheric scatter links represent the advance component of a Forward Scatter System, now being implemented, which will make available to Allied Command Europe an integrated, reliable, high capacity signals sys-

Top picture, opposite page, an artist's conception of the principle of ionospheric scatter propagation. Lower left, participants in the ceremony marking transfer to SHAPE of "Project DOUBLE JUMP." Left to right: Maj. Gen. Walter B. Yeager, USA; Dr. J. Piket, SADTC; Maj. Gen. Victor A. Conrad, USA; Maj. Gen. E. Blair Garland, USAF (Ret.); Joseph A. Waldschmitt, Executive Vice President, Page Communications Engineers, Inc.; Dr. G. J. Sizoo,

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Lower right, a U. S. Navy man and an Italian Air Force man making field intensity and noise measurements at the Naples-Izmir Ionospheric Scatter site.

Above, Italian workmen make a periodic maintenance check on a high antenna tower of a transmitter-receiver station located outside Naples. The complex of antenna wires forms a 60-degree corner from which radio signals are both transmitted and received by being precisely aimed to bounce off the ionosphere.

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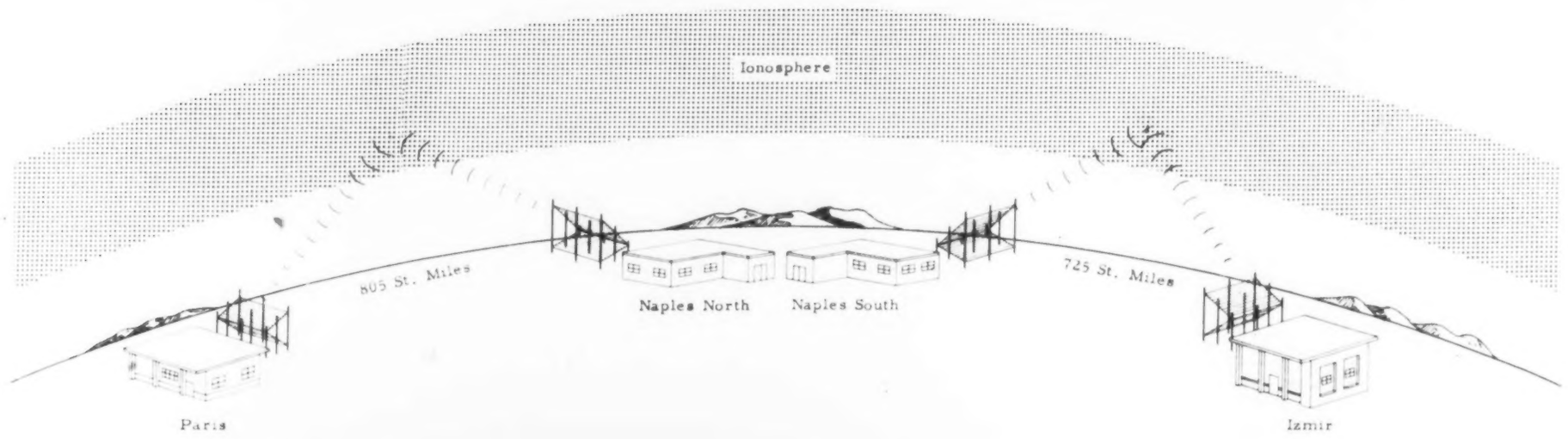

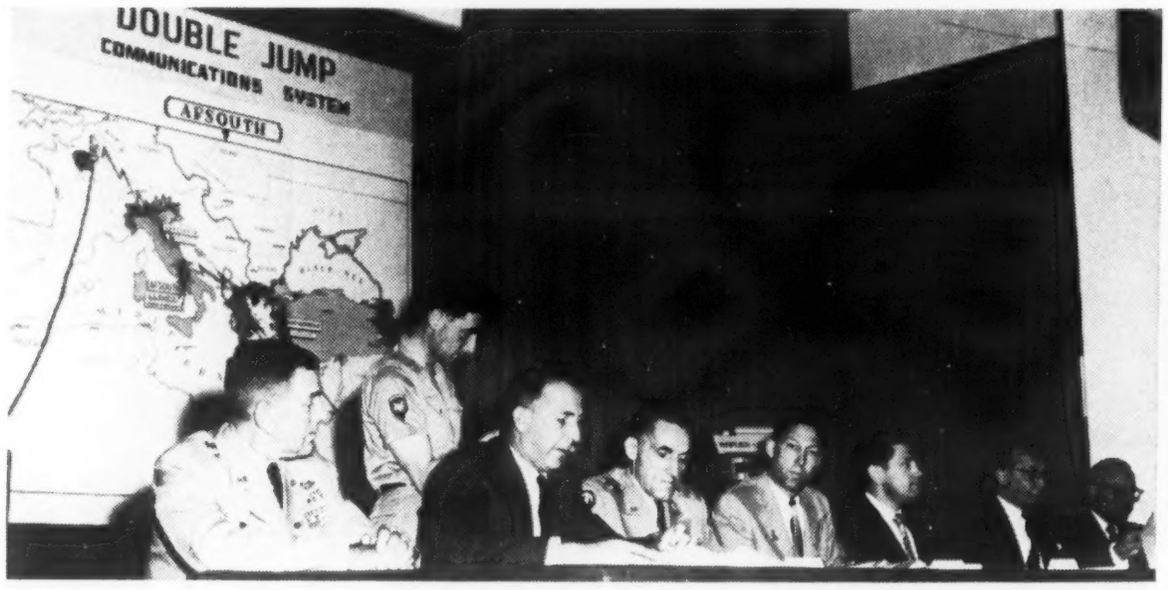

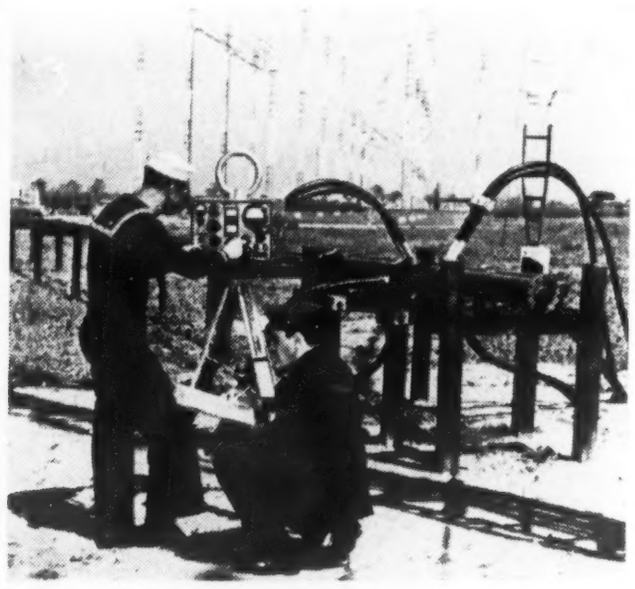

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tem to support the most vital of our operational functions.

The remainder of the SHAPE system is being built under the NATO common infrastructure programs, but with substantial changes in normal practices. For example, in a standard project to be financed from international funds most of the contracting and actual construction is done by the host country; yet, because the forward scatter project spans several nations, this was technically impossible, so SHAPE itself assumed the role of host country, called for bids and awarded the contracts. At this time, all important contracts have been awarded and the final completion of the entire system is in sight.

The ultimate system, which will extend from the North of Norway to the Eastern Border of Turkey, with stations in nine NATO nations, will be a splendid example of the concrete attainments from NATO cooperation. Also, it will be an outstanding illustration of effort, time and finances invested by the peoples of our alliance to aid our common cause.

MR. PAGE:

IN THIS MISSILE AGE, it is a challenge for a communications company to play a vital role in protecting the security of the Free World. Page Communications Engineers, Inc., faced such a challenge in 1957 when they were approached by SHAPE Air Defense Technical Center officials and asked to design and build a North Atlantic Treaty Organization (NATO) communications network linking the Supreme Headquarters Allied Powers Europe (SHAPE) in Paris, France, with Allied Forces Southern Europe (AFSOUTH) in Naples, Italy, and Allied Land Forces Southeastern Europe (LANDSOUTHEAST) in Izmir, Turkey. The ultimate in reliability was mandatory for the integrated defense of the NATO countries. Long experience in solving complex communications problems for the United States Armed Forces and in working with nationals in many areas of the globe had schooled Page people for this job.

Page scientists and engineers knew that for direct communication over distances such as this—involving 1600 miles over-all—the ionospheric-scatter mode of propagation at VHF had proven remarkably successful. Ionoscatter operates on the principle of scattering very-high-frequency radio waves in the ionized layers in the earth's upper atmosphere. The signals are then picked up at the desired point on the ground by highly sensitive receiving equipment. Because ionization in the region where the scattering takes place is always present, an exceptionally high degree of reliability is obtained.

Study Site Location

Page recommended duplexed multichannel ionoscatter facilities for a two-hop system, with circuits linking Paris to Naples and Naples to Izmir, and with local UHF relay links to existing communications centers. SHAPE Air Defense Technical Center (SADTC), The Hague, approved the system design, and NATO's "Project DOUBLE JUMP" was under way. In each case, land was made available by the host countries.

A year before the $4,250,000 contract was executed, Page joined SADTC in an intensive study of the sites to determine their technical feasibility. The following factors were considered in determining site locations: soil conditions, accessibility, power, utilities transportation, construction contractors and suppliers.

Work on Project DOUBLE JUMP began in February 1957, and the first signals were passed over the network in January 1959. During subsequent months, Page carried out an intensive test program. NATO communications to the subordinate commands, which formerly took eight hours, now proved to be virtually instantaneous. DOUBLE JUMP met all requirements and was triggered into operation at Naples on May 22, 1959, by Major General Victor A. Conrad, Chief Signal Officer, SHAPE. At that time the system was described by the military as having a reliability approaching one hundred percent.

Central stations in the DOUBLE JUMP system are at Naples South and Naples North. The Paris-Naples circuit is equipped at each station with two 25-kw VHF transmitters. The Naples-Izmir circuit is identical, except that it employs two 60-kw VHF transmitters at each station. The transmitters at each station may be operated either on a common frequency and in parallel into a common antenna, or on separate frequencies, each into its own antenna. The same modulation is applied to both transmitters. Parallel operation has the advantage of providing an improvement in reliability. Dual space diversity reception is obtained by duplexing the transmitting antennas. Additional diversity improvement is achieved by the use of decision threshold computers, recently developed by Page, in the specially designed FSK receivers.

Each terminal has four high-gain, 60° corner-reflector antennas, with six collinear full-wave elements in each. Two antennas are operated in a low VHF band, while the other pair provides alternate operation in a higher VHF band. The system is designed for high circuit availability throughout the solar cycle. But numerous frequency changes, such as the diurnal and seasonal changes needed in short-wave communications, are unnecessary—thus providing almost uninterrupted service.

The intrasite radio link systems provide duplicate circuits from communications centers to each respective scatter station, utilizing space and frequency-diversity configuration. Sixteen teleprinter channels are derived in this system by means of time-division multiplexing. Simultaneously, a voice channel is provided on a frequency-division basis.

Each station has an equipment building, staff quarters, and a building to accommodate the diesel generators, which provide primary power at Izmir and back-up for the commercial primary power used at Paris and Naples.

International System

DOUBLE JUMP is in every sense an international system. It would never have been possible without the wholehearted cooperation of the Governments of France, Italy, and Turkey. The superb assistance rendered by the military in each of the respective countries is another example of the good relations existing among the NATO nations. The equipment and material comprising the network were obtained from seven European nations and the United States.

As in all of our overseas operations, we hired and trained local nationals to build and install the system. The socio-economic advantages are obvious. Many of these employees became proficient and found ready employment elsewhere for their new skills upon completion of work on DOUBLE JUMP.

The system is the first of its kind to span Europe. It will be operated and maintained by military personnel from each of the host countries and the United States, upon completion of the training program currently being conducted by Page.

A sentinel of peace, DOUBLE JUMP stands ready to flash the alert in time of danger. This could be communications' greatest service to mankind.

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MILITARY ELECTRONICS DIVISION CHICAGO 24, ILLINOIS

URGENT PROBLEMS RELIABLY SOLVED

PROJECT MERCURY

man's venture into space

by

DR. T. KEITH GLENNAN
Administrator
National Aeronautics and
Space Administration

ONE DAY WITHIN THE NEXT few years, a young man in a pressure suit will step from a gantry tower into a checkered capsule atop a giant Atlas missile. About one hour later, with the pilot secure in a form-fitting couch facing upward, the hatch will be bolted. With a roar, the missile will streak into space.

Project Mercury, the fruit of millions of dollars investment and untold man-hours of work by thousands of scientists and engineers in NASA, the military, and private industry will reach its climax. It was on October 5, 1958, four days after NASA became officially operative, that Project Mercury was born. The project has two objectives: 1) scientifically, we wish to study human capabilities and reaction in the space environment; and 2) technologically, we wish to study the system requirements necessary to sustain the launch, flight, and successful re-entry from orbital speeds.

Last April, as you know, we selected seven Mercury Astronauts from among hundreds of military test pilots—an amazing group of young men all of whom are in superb mental, physical and psychological shape. One of them will be chosen for the historic first flight.

NASA's Space Task Group at Langley Field, Va., directs the project with assistance from the Advanced Research Projects Agency of the Department of Defense and the Armed Services.

In order to accomplish at the earliest possible time the objectives that I have just stated, the project has been developed around three basic principles: First, simplicity and reliability. The entire project should have the simplest and most reliable approach conceivable at the present state-of-the-art. Second, no prolonged research. The project should require a minimum of new developments and breakthroughs. This is, of course, consistent with the first principle. Third, and very important, the method chosen should permit a gradual build-up in technology and performance culminating in the final orbital flight.

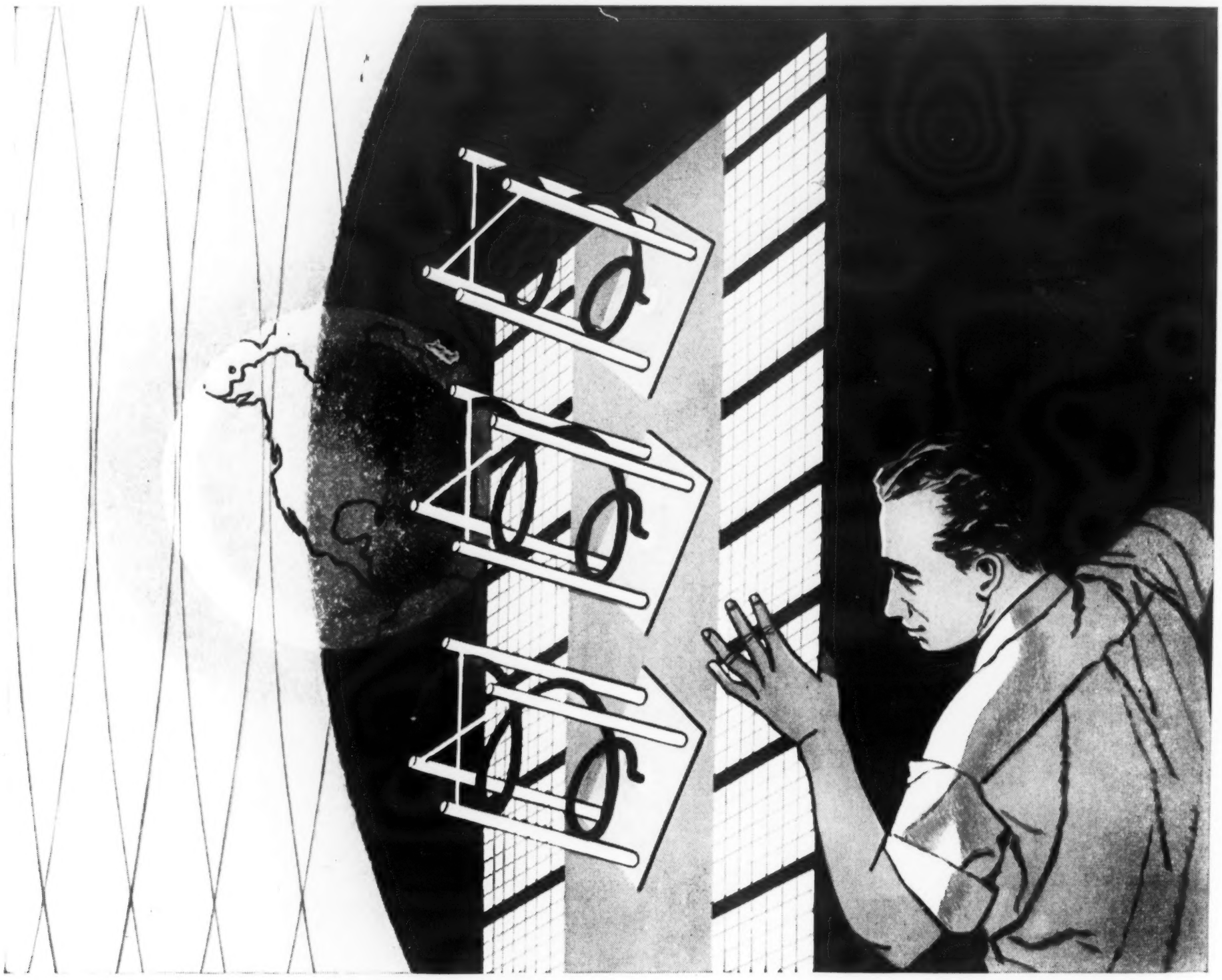
To satisfy these objectives, the so-called high drag or blunt nose body was chosen for the vehicle because we simply know more about this kind of re-entry than any other kind.

In order to minimize the need for new developments, a standard ICBM, the Atlas, was selected as the take-off vehicle.

Capsule deceleration and re-entry will be accomplished with small retro-rockets. In the interest of simplicity, it was decided that the landing should be made by parachute. Finally, and very important, it was decided that a positive escape system should be incorporated in the vehicle to assure, to the greatest possible extent, Astronaut safety. The system operates in the event of malfunction during the launch phase or before the vehicle attains orbital flight speeds.

(*Continued on page* 42)

SYLVANIA ELECTRONIC SYSTEMS . . . **IN FIELD ENGINEERING**



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NATO INFRASTRUCTURE

by ERNEST H. MEILI
Assistant Secretary General
for Production and Logistics
NATO, Paris

It is a pleasure to present the following article, by Ernest H. Meili, which is also covered in the NATO Letter, a special issue covering 10 years of Atlantic cooperation.

NATO COMMON Infrastructure Installations are those fixed installations which are necessary for the deployment and operations of the Armed Forces. They are called NATO Common Infrastructure Installations because they are financed collectively by member governments.

The need for common infrastructure first became apparent after the Western Union had been formed under the Brussels Treaty. At that time the military forces available were limited and an infrastructure program of only some £32* million was envisaged. Most of the needed installations consisted of airfields and signals communications to be set up in France and the Netherlands for the use of the five Brussels Treaty Powers.

These Powers agreed to share the cost of the program which became known as the "First Slice." This was the origin of the principle of cost-sharing, which was later adopted by NATO for all subsequent common infrastructure programs.

Since late 1951, the North Atlantic Council has approved successive slices of common infrastructure amounting to a total of approximately £1000 million. The whole of this amount is being financed collectively by NATO member countries under the terms of the various cost-sharing agreements, and the following table gives an idea of the successive programs and the corresponding financial commitments.

AGREED FOR COST-SHARING	£'000's	TYPE OF PROJECT
Slice I, in 1949	32	(Non-NATO-Western Union) Airfields and Signals Communications.
Slice II, in 1951	124	Airfields and Signal Communications.
Slice III, in 1952	183	Airfields, Signal Communications and War HQs.
Slices IV a and b, in 1952	145	Airfields, Signal Communications, War HQs, POL System, Naval facilities and training installations.
Slices V, VI and VII, in 1953	250	Airfields, Signal Communications, War HQs, POL System and Naval facilities.
Slices VI b, VIII, IX, X, and XI, in 1956	244	Airfields, Signal Communications, War HQs, POL System, Naval facilities, Early Warning Radar installations, Forward Scatter and Ground-to-Air Missile sites.
Total for 11 Slices financed by NATO	978	

The substantial increase in infrastructure programing which has taken place over the years is of course due to several well-known factors, such as the addition of new members to the Alliance, the increase in military forces and the modernization of weapons and equipment, and as can be seen from the above table the projects, which initially only included airfields and certain communications now cover a wide variety of fixed installations.

Common Financing

The decision taken originally by the Brussels Treaty Powers and subsequently adopted by NATO to share the cost of infrastructure projects no matter where located was, of course, based on very sound reasoning. It is an accepted principle that such NATO installations set up on a national territory can be used by the forces of any other member country. For this reason alone it would not be equitable for the host country to carry the entire expense involved, particularly as for geographical reasons some countries have a disproportionate share of such installations, which would place an intolerable financial burden on them.

A fair method of spreading the costs over the entire Alliance had therefore to be sought, and was found. However, this common financing covers only construction and installation, and the host countries still have to bear a fairly substantial percentage of the total expenditure such as the cost of the land, of public utilities, etc.

The cost-sharing formula actually adopted and agreed upon was based on three essential criteria: the contributive capacity of the member countries, the advantage accruing to the user country, and the economic benefit for the host country.

The contributive capacity of member countries is calculated on the basis of the national product, which is the best available indication of the wealth of a country and of its capacity to pay.

*(The official rate of exchange is $2.80 per pound. The current market rate of exchange is $2.86.)

The host country derives some economic benefits, which often outweigh the above-mentioned burden inherent in the acquisition of and payment for land, the provision of local utilities, etc. These infrastructure works have brought most welcome employment to local manpower, and have in many instances largely contributed to the building up of existing and new local industries. Countries which were technically less well developed than others have been helped substantially by the engineering experience thus gained. Some of the infrastructure projects, such as fuel pipelines and storage facilities, were the first of their kind to be introduced in many NATO member countries, and the vast sums of money spent on these projects have enabled some of the host countries to develop technical know-how which they could not have afforded from their own resources. Thus, infrastructure has in a large measure contributed to making the technologically weaker members much stronger.

Planning and Execution of Infrastructure Projects

At the outset, the subordinate Military Commanders notify their Supreme Commanders of the infrastructure work required in their areas. The Supreme Commanders then coordinate these requests after satisfying themselves that the projects proposed are essential for the support of their forces and that they are suitable for common use. During the preparation of these programs, the Supreme Commanders consult the experts of the NATO International Staff to ensure that the cost estimates are reasonable, that projects are technically sound and that military requirements are being met at minimum cost to NATO.

The program is then sent to the Standing Group in Washington, D. C., and to the Infrastructure Committee of the North Atlantic Council. The Standing Group examines it from the point of view of military necessity and urgency and submits its comments to the Military Committee. The Infrastructure Committee examines it from the financial and technical point of view to ensure that the proposed installations are for common use and therefore qualify for common financing. The final reports from the Military Committee and the Infrastructure Committee are then submitted to the Council and considered simultaneously for approval, which automatically commits the member countries to the resulting financial contributions on the basis of agreed percentages.

Once projects have been approved by the Council, full responsibility for the construction is assumed by the respective host countries (the country on whose territory such installations are being built). Nearly all NATO member countries are host countries at the present time.

The host country has the task of deciding, in consultation with NATO military authorities, on the exact location of the project, of acquiring the necessary land at its own expense, and of drawing up plans which are then sent to the Military authorities for approval.

Subsequent steps are as follows. Detailed estimates are drawn up of the cost of construction; these must receive the approval of the NATO Infrastructure Payments and Progress Committee before any funds can be committed. The host government then invites firms in all NATO member countries to bid for the contract and notifies national delegations of the opening and closing dates. This accepted policy of submitting contracts to international competitive bidding ensures, of course, that all member countries who must contribute to all projects also have an equal opportunity to bid for the work. After adjudication, and when the work is under way, technicians from the International Staff, representatives of the Supreme Commanders and of the user nation will visit the sites and submit progress reports.

The NATO International Staff does not handle the actual money transfers. The country carrying out the construction is paid directly by the other member countries on the basis of previously accepted percentages. Procedures have been worked out to settle these accounts quarterly.

Final Inspection

After a project is completed, final inspection takes place. A team consisting of a representative of the International Staff (Chairman), a representative of the Military, a representative of the host country and, in cases where the user country is not the host country, a representative of the user country, visit the installation. On the basis of their report, the Infrastructure Committee considers the acceptance by NATO of the installation.

The final touch to the project is given by the International Board of Auditors for Infrastructure, which was constituted some years ago to examine the justification as for payment by NATO of all charges applied. After the Auditors have completed their work they tender a "Certificate" to the host country.

It is obvious that these very expensive installations, the cost of which has been borne by all member countries, must be maintained to ensure the longest possible period of usefulness. However, maintenance is not the concern of the NATO Infrastructure organization but is, on the contrary, the responsibility of the user country which, in many instances, is also the host country. It is only in more recent times that some exceptions have had to be made to this rule, particularly in the communications field where installations could not be allocated to any specific user country and for the maintenance of which NATO military organizations will be responsible.

Accomplishments

The following table, which gives an idea of the actual accomplishments of the Infrastructure Program over a period of 10 years, is most impressive evidence of what the will to cooperate can achieve:

More than 200 airfields constructed or usable in an emergency;

4,700 miles or 7,500 kilometres of pipelines laid;

Nearly 2 million cubic metres of Fuel Storage constructed;

Tens of thousands of kilometres of open wire lines, radio links, submarine cables and land cables completed or under construction;

Naval facilities such as piers, breakwaters, storage for naval oil and ammunition which have been or are being built to a value of £86 million;

A huge network of radar warning installations under construction as well as a system of communications called "Forward Scatter."

Conclusions

If one had been asked in 1949, the year NATO was formed, to prophesy what results would have been achieved in Infrastructure within 10 years it is unlikely that one would have been anywhere near the mark.

In Infrastructure one might have prophesied vast works of construction of all kinds, and there indeed one would have been right, but it is unlikely that one would have foreseen the close-knit and effective cooperation between civilian and military authorities, national and international, which has enabled 15 nations to agree not only on the construction of so many projects but on the control, both physical and financial, of their execution.

With such a start we can look forward to the next ten years not only with confidence but with eagerness.

Admiral Virden is pictured as he addressed the New York Chapter of AFCEA.

COMMUNICATION REQUIREMENTS OF OUR NAVY

by
RAdm. FRANK VIRDEN, USN
Director
Naval Communications

AN ANALYSIS OF world events of the past few years brings into focus a definite pattern of Communist action which is hostile to world peace and freedom. The pattern works under a precarious cover of nuclear balance and is composed of economic, political, psycho-social and military pressures, all used with versatility and flexibility to achieve Communist objectives.

Korea, Vietnam, Suez, Hungary, Lebanon, Taiwan, Iraq, Berlin, Tibet and Laos—there you see these pressures at work. So also do you see them in Iran, in the Caribbean, in South America, and, to a degree in Africa. You see them at work in every non-Communist country where there is an opportunity to upset the existing order.

You may also see opposing pressure, the presence of U. S. military forces near these areas of tension. You have noticed that the presence of our troops nearby has prevented, in many cases, these hostile pressures from bursting into uncontrollable conflict.

The Navy has played a major part in spearheading the prevention of war. Our prime example of this role was provided by the 1958 crisis involving Quemoy. With 2,500,000 troops and over 1,800 Chinese Communist jet fighters threatening them, the Nationalists received decisive U. S. Navy support including six attack carriers, three heavy cruisers, 50 destroyers, nine submarines and 43 squadrons of aircraft.

The Army and the Air Force were also deployed in the general area. But this was the type of operation to which the Navy's limited war capabilities are ideally adapted, even though those capabilities were being used at the same time in a different crisis, Lebanon.

This points out that though the main task of the Army, Navy, and Air Force is to be ready for all out war, the Navy as a Johnny-on-the-spot has to be ready for what is happening every day—for political upheavals of all sorts, for incipient, too often actual, limited war.

Today's Navy stays ready to meet limited war requirements. Its deployed fleets are largely self-sufficient. Each has its own attack carrier striking force, an amphibious landing force, a Fleet Marine Force, and a mobile logistic support group. These are usually engaged in peaceful pursuits and training missions, but they are ready to move into troubled areas and apply military and political pressure wherever and whenever needed to keep the peace. They are also ready to react immediately with powerful modern weapons if worse comes to worst. Even if land-based forces are knocked out, these moving sea-based forces have an excellent chance of survival.

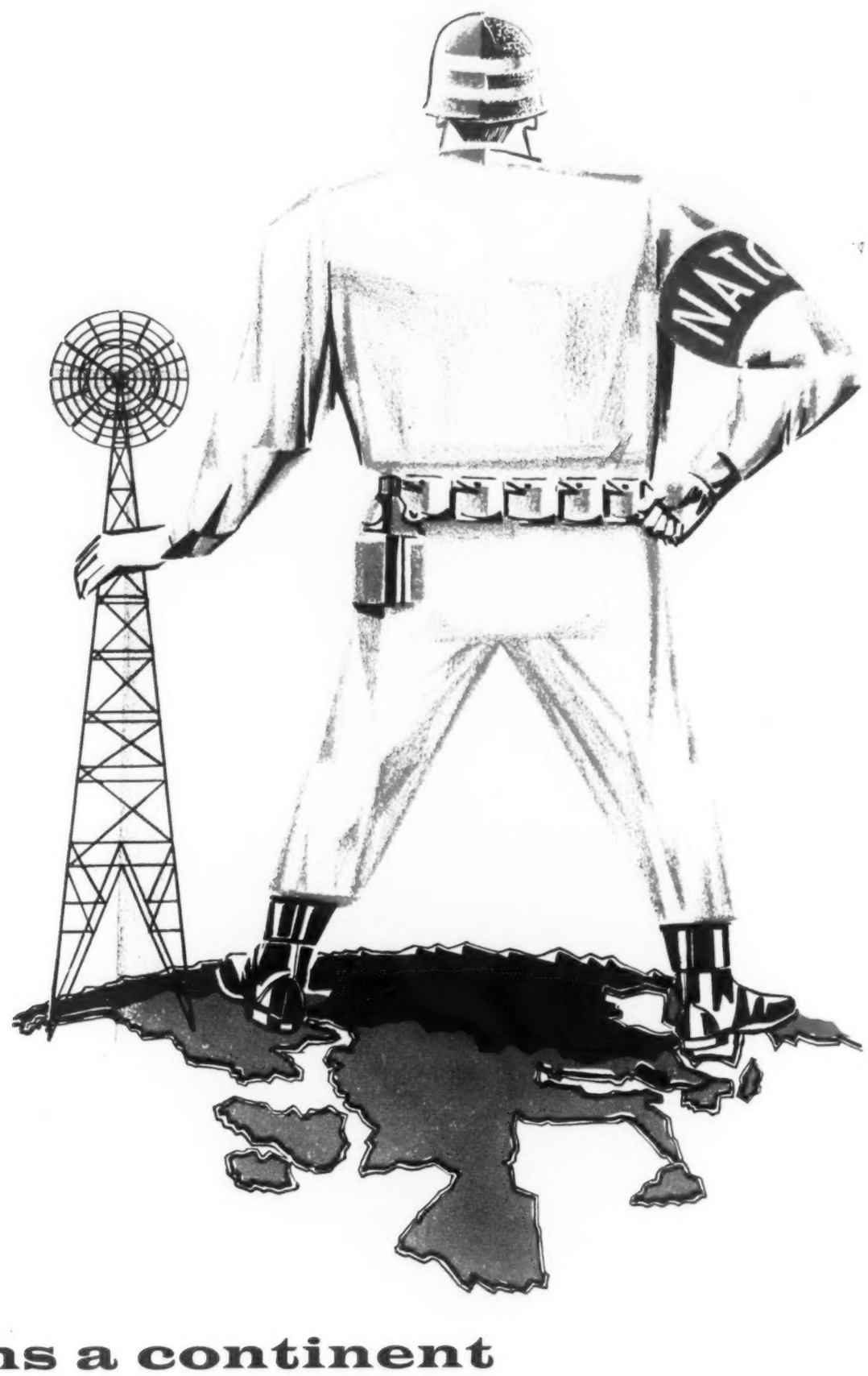
The modern Navy not only has the largest wallop of any Navy ever known, but it spends more time at sea—out on the line—than any of its predecessors. The roles, missions and tasks of this Navy add up to an impressive list of duties. The Navy and Marine Corps must operate forces on, under and over the seven seas. They must be ready to operate on any lands bordering the seas. Obviously we do not operate in all these waters all the time. We maintain self-sufficient fleets in the Pacific and in the Mediterranean while we manage to show the flag in all waters from time to time as the occasion arises. The Navy must be able to go wherever there is sufficient water under the keel or a wide enough channel, whether for an Operation Inland Seas in the Great Lakes or for a hydrographic survey to the Black Sea. In all our efforts we carry out a major part of the vastly complicated task of maintaining the peace. We act as a shield for sincere diplomatic efforts while simultaneously maintaining a capability to take part in all-out war.

The Pacific operations provide a good example of the magnitude of today's Naval strength. From California to the Indian Ocean and from Alaska to the Antarctic—roughly one-third of the earth's surface—382,000 officers and men serve in over 400 ships and nearly 3000 planes and on shore bases. We patrol the Barrier Pacific—and the Distant Early Warning Line from the Aleutian Islands to Midway 2,250 miles away—a daily 16-hour patrol flight for planes and several weeks at sea for ships on station.

On a typical day with the Pacific Fleet west of the Marianas, if you could observe it from above, you might see minesweepers engaged in joint exercises with Japanese ships near Japan, a submarine hunter-killer team of aircraft carriers and destroyers training in the Ryukyu Islands, amphibious units exercising with the Army and the Marines on Okinawa, a carrier and escort destroyers patrolling off Formosa, amphibious units conducting joint operations with the Philippine Navy as well as the service force carrying its "beans and bullets" to all these units, wherever they are. And let us not forget "OPERATION DEEPFREEZE" presently being conducted in the Antarctic.

In war operations of the tasks as-

(*Continued on page* 16)



Sentry that spans a continent

The pre-eminence of Radio Engineering Laboratories, Inc., in specialized radio communications is again underscored by the selection of its equipment for the gigantic tropospheric scatter network being constructed by NATO.

This network, with more than a continental span, will stretch from Norway to Turkey. It is larger by far than any other tropo communications complex yet conceived. REL has designed and is constructing one hundred fifty-three transmitter modulators, one hundred nine 10-kilowatt amplifiers, and seventy-seven quadruple diversity receivers with combiners.

With millions of lives at stake, only supremely reliable equipment could be considered. REL, which has developed and manufactured more tropo scatter radio apparatus than all other companies combined, was awarded the contract after international competitive bidding in accordance with NATO infra-structure procedure.

The imagination and facilities which have won REL world leadership in military and civil tropo scatter can help solve *your* specialized radio problems.

REL

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Communication Requirements

(*Continued from page* 14)

signed to the Navy's ships, airplanes, and land bases—whether patrolling, training or supplying—none could be accomplished without command control coordinated through specialized communications tailored to the Navy's unique requirements. Communications in the modern Navy becomes increasingly important as worldwide deployment of forces becomes the order of the day. We must have unprecedented speed and reliability to communicate directly to, from and within these mobile forces with their staggering firepower. And these communications must operate in a shipboard environment of steel ships in salt water surrounded by other electronic equipments.

Communication Requirements of Ships

Every one of our commissioned ships is a mobile radio station, required to give superior performance in an inferior radio environment. These ships are extremely crowded with electronic equipment which causes mutual interference. Antennas for radio transmitters, for instance, must be widely separated from receiver antennas if harmful interference is to be avoided. This is done as a matter of common engineering practice in shore installations. Aboard ship, the problem must be solved by other means.

Ships also are constantly on the move. Wire-stringing for communication is almost out of the question, not that it hasn't been tried—we are game for anything—but only radio will provide our rapid distance communications. With submarines, covered by the sea, communications by radio are further limited by frequency and by equipment problems, for sending messages as well as for receiving them, as is well evidenced in submarine warfare operations.

A typical anti-submarine warfare (ASW) force includes submarine, surface units and aircraft. The aircraft are both carrier-based and shore-based types. Reporting a contact, coordinating the information and command controlling all these different types of forces require immediate, accurate communications. Such communications are easily provided between an airplane and a ship, but the difficulty arises when the airplane, or even the ship, must communicate with the submerged friendly submarine. You can imagine the problem.

For example, although very low frequency radio waves will penetrate sea water, signals must be very strong, and transmitter power and antennas are too great for an airplane or even a surface ship to carry in the present state of the art. We have to get around this problem in other ways.

Tactics of the nuclear age fleets require a different type of communications from ship to ship. During World War II, Naval task forces were relatively compact. Communications within a task force were provided by line-of-sight radio, and by visual flag hoist and blinker communications. However, along came the nuclear weapon with its wide-area destructive power—together with naval offensive weapons of greater power and longer range. These brought about an expanded task force formation. Today's carrier task force steams in formations dispersed over hundreds, or even thousands of square miles of ocean. Naturally this affects communications. Line-of-sight radio is no longer enough. The use of frequencies giving several hundred miles range is necessary, or a formidable choice presents itself to the commander: communications or safety.

The requirement for ships to communicate with shore stations is met in the ship-to-shore circuits. These circuits resemble conventional shore-based point-to-point circuits except for the major difference that one of the points is continually on the move. For senior commanders afloat, these circuits are activated around the clock and provide a path for messages from the shore station as well as to the shore station.

Fleet Communication Requirements Ashore

Radio equipments ashore must be able to reach the moving ships wherever they may be. This all but denies us the use of the highly efficient directional antennas that can be and are used on fixed point-to-point circuits, except where we can use directional beams to cover narrow sea areas.

In order to be able to get messages to the fleets wherever they may be, the Navy's shore communication stations are located around the world. These stations are joined together by conventional radio or landline point-to-point circuits, providing command access to and from the operating forces, and providing the required ocean coverage.

Besides the use of ship-to-shore circuitry, the shore stations deliver messages to ships at sea by means of broadcasts. Everyone can recognize the difference between broadcast and point-to-point communications because of radio and TV, and the telephone. A *fleet* broadcast enables many ships in an area to copy the same schedule, receiving the same messages simultaneously, a method faster than any known system of relay for reaching a large number of stations at once.

All ships are required to copy broadcasts, and the shore stations consider a message to be delivered once it is placed on a broadcast; however, with no receipt or verification of delivery required, the broadcast must be of very high quality throughout the broad sea area of its coverage.

Finally, particular operations generate a need for functional networks. Since the Second World War, the requirement for systems which support a single type of operation has mushroomed, mainly because of the necessity for radically swift and reliable communications. These functional networks are expensive—they are expensive from a manpower standpoint, as well as from the standpoint of the frequency spectrum. But they are necessary, and we have to provide them.

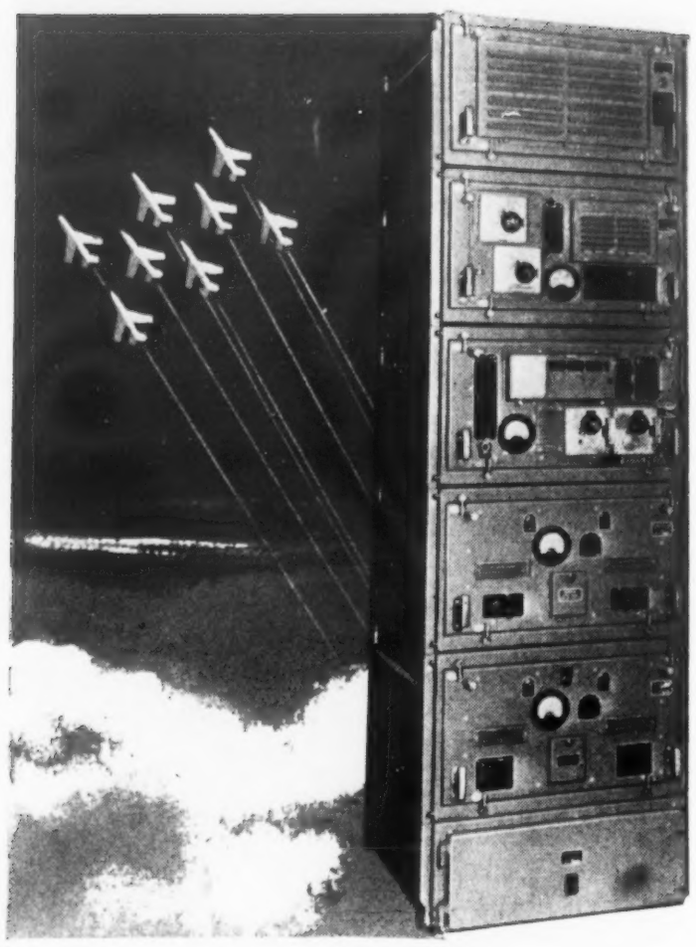
Improving Capabilities to Meet Requirements

I have told you briefly about our operating requirements. We have other requirements, too, which are more general. First of all, we have to improve our communications capabilities. At present we are doing this through improvement programs, through research and development, and through experimentation.

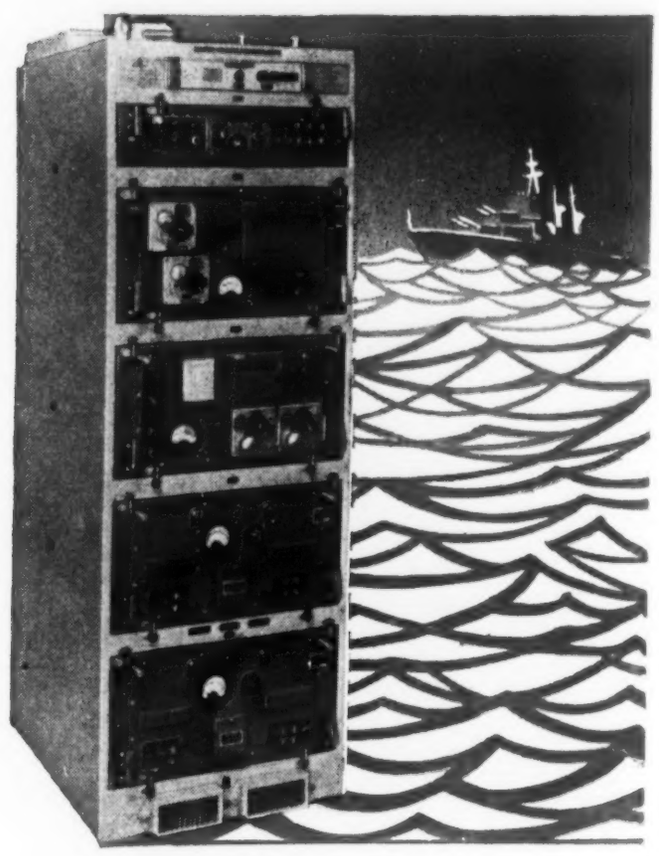
Shipboard antennas are being drastically improved through an Antenna Improvement Program. In ship construction of past years, antennas have been placed where they would be out of the line of fire, or they were placed where there was room for them after everything else was installed. Radiation efficiency came second to the physical demands of weapons and to the design of a ship's top-hamper. On the other hand, the requirement for high radiation efficiency did not exist then as it does now. Today, when one ship can carry the punch of an entire World War II task force, we devote full attention to the antennas which control this firepower. Our new antenna designs allow for more capacity. Several receivers will be able to operate on a single antenna. Such new designs are being built into our new ships, and we are back-fitting as fast as our funds will allow.

Perhaps the greatest boon to our widely dispersed forces came with single sideband equipment. SSB greatly increases the reliable range at no added cost in power, weight, or space, and it uses only half as much

(*Continued on page* 35)



Commanding Voice



Instantaneous, intelligible contact no matter how exacting the conditions—that is the primary requirement of communications in any sphere of offensive or defensive operations.

To meet this need, on the battlefield, in the air and at sea, The Plessey Company, in collaboration with various Government Research and Supply Establishments in Great Britain, has produced a comprehensive range of transmitting and receiving equipment, each specifically designed for its particular application.

For the British and Commonwealth Armies, short-range speech contact to armoured fighting vehicles in the forward areas is maintained with maximum clarity by V.H.F. equipment incorporating revolutionary improvements in electronic and mechanical efficiency. This equipment provides the practical solution to instantaneous communication in mobile warfare.

In meeting the different demands of the air and naval forces, the Company has developed and manufactured Ultra High Frequency equipment, which operates over the whole military UHF band of 225–400 megacycles, providing 1750 as against the existing 560 VHF channels. (A variation is available with 50 Kc/s bandwidth, giving 3500 channels.) Independent of any other form of radio communication activity, it is free from interference and fading and is the most advanced communications equipment of its kind.

For accurate, instantaneous and completely clear communication, the Plessey system of UHF has already been adopted as standard in the Royal Air Force, the Royal Navy, the Navies of the Commonwealth and is also used by the Naval and Air forces of some N.A.T.O. member countries.

The Plessey Company Limited is able to provide these equipments now to authorities in all parts of the world where thoroughly clear and reliable communications are to play a vital role.

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MALCOLM SCOTT CARPENTER

THE ASTRONAUTS SPEAK OUT

WALTER MARTY SCHIRRA, JR.

ALAN BARTLETT SHEPARD, JR.

at a press conference at the air force ballistic missile division, inglewood, calif.

LEROY GORDON COOPER, JR.

JOHN HERSCHEL GLENN, JR.

VIRGIL IVAN GRISSOM

DONALD KENT SLAYTON

General Ritland: As you know, we in the Air Force Ballistic Missile Division have a certain responsibility in Project Mercury. The Division, with its contractors and the local complex, including STL—Space Technology Laboratories—has the responsibility for launching the Project Mercury, guiding it into orbit, developing an abort system, and participating in the communications and tracking later on in the program.

There is a great correlation to the work that we have to do for these young gentlemen as it applies to the work that they have been doing in their flight test business in the past. We are part of their team.

Our purpose here today is to brief the Astronauts on our activities, what we are doing, what we can do for them, and what they can do for us. More specifically, we are the part of the team that they are used to—the flight test engineers and the maintenance people that they have been operating with in testing aircraft.

I would like to introduce General Doolittle, whom you know very well.

General Doolittle: I would like to welcome, along with you, the Astronauts here, and wish them well, and to assure them that the facilities of STL are entirely at their disposal for any way in which we can be helpful.

General Ritland: I think you all know Colonel Powers. He was with us for some time out here. He will take over now and introduce the Astronauts.

Powers: Thank you, General. Let me say first of all it is good to be back.

The only reservation I have in acting in behalf of the NASA Space Task Group is that on occasion there may be a general question about the project which the Mercury Astronauts may be less well equipped to answer than I, in which case I will answer for the Agency.

Gentlemen, do you have any questions?

Question: We have only six Astronauts here.

Powers: Donald K. Slayton is not with us. He is back at Langley, catching up on some book work. He picked up a slight virus last week, and we decided to give him a little rest. It would be better for him, better for us, and better all around if we came on without him.

Question: I would like to know if there will be any suborbital Atlas operations as well as Redstone.

Glenn: No, none of those are scheduled at the present time. To my knowledge, there is no plan at all to make any suborbital flights with anything except the Redstones.

Question: Will a man who makes the Redstone flight carry right on through, or will all of you gentlemen make Redstone flights until you get to the final portion of the program?

Glenn: This is not a real definite laid-out program yet, as far as that part of it goes. The way the first Redstone flights progress, the unmanned and then the animal shots, will determine how many of the Redstones we have to use in the program, with a limited number of Redstones in the whole program.

Certainly the majority of us will ride the Redstone, I am sure. But there is no certainty that the man who rides the first Redstone will also be the one who carries on into the Atlas.

Also participating:

MAJ. GEN. OSMOND J. RITLAND, USAF, Commander for Ballistic Missile Div.; GEN. JAMES H. DOOLITTLE, USAF (Ret.), Chairman of the Board, Space Technology Laboratories; LT. COL. JOHN POWERS, USAF, Public Affairs Officer, Space Task Group, NASA

Powers: I think maybe to ease this give and take a little bit we will start with Alan Shepard and ask each of the Astronauts to tell you what is his particular area of specialization in the Project Mercury.

Shepard: To start with, you know the entire program of putting a man in space is a very complex one. We will be trained in all of the facets of the program to the degree which we feel we can logically accept.

In addition to that, each one of us has a particular area which has been assigned to us for individual study. The main process here is that each one of us takes his area and studies it much more carefully than the rest of the group, and then we are responsible to the rest of the group for that particular area.

With that as a foreground, the areas with which I am concerned are the recovery of the capsule after landing, and the world-wide tracking range of stations. In the first case, of course, the capsule is programmed to land in the water in the vicinity of the Atlantic Missile Range. The monitoring of recovery efforts is one of my considerations.

The second, as you well realize, as this capsule goes in orbit around the world, we want to keep in as close contact with it as possible. Not only voice communication but also telemetering and finite tracking. So these are my two areas of consideration.

Schirra: I am concerned with the environmental control system. Another way of putting it would be the life support system within the capsule while the capsule is in orbit. This involves maintaining an atmosphere which is approximately equivalent to 27,000 feet around our normal atmosphere in the earth area. This will be maintained in the cabin itself and will be backed up by a full pressure suit that the Astronaut will wear while in orbit.

The full pressure suit has a requirement for ventilation which will be part of its normal mission. The full pressure suit as a pressure suit alone is a back-up in case there is something wrong with the cabin system. The ventilation is a requirement to withstand the heat upon re-entry.

Grissom: My area of responsibility is the flight control system and the autopilot. At the time the capsule separates from the Atlas the automatic pilot takes over and puts the capsule in the proper position for orbit, and controls it in its attitude as it orbits around the earth. This also includes the sensors that sense the horizon in order to control the attitude properly. It includes the reaction controls that are used to change the attitude of the capsule. It includes the hand controller which the pilot can use at his option to control the attitude of the capsule himself, or in the event of an automatic pilot failure he then can control the attitude of the capsule.

Glenn: My area is the cockpit layout, or the Astronauts' working space in this—as far as the presentation of instruments, the way information from these instruments is sent to the pilot—in other words, how we want the cockpit organized. This is an area, of course, that had to come up almost immediately as soon as we got on the project, so we have already done quite a bit of work in this field. This is something that had to get firmed up fairly early in the program.

It is also an area that is a little difficult to tie down sometimes because it is an opinion area. As any of you who are pilots know, you can get as many ideas on instrument layout as you have pilots to give the ideas.

Cooper: My areas are the ballistic flights with the Redstone missile, both the stability and the performance of the combination of the missile with the capsule on it.

Carpenter: My area is communications and navigation. The communications end touches on telemetry and voice communications and some of the radar installations, beacons and so forth. Navigation for this mission is about half the job that it would be in other applications.

It is generally detection of and correction of errors. In our case it is solely a detection, since we don't have the capability of correcting. This touches on maps that we will be using, plus the periscope which gives us the visual presentation of the ground over which we are flying.

Question: I would like to ask, in the attitude change, the 180 degree switch, does that come right after going into orbit or before re-entry?

Grissom: As soon as the capsule separates from the Atlas it rotates 180 degrees into the retro attitude. In case there is a malfunction at this time, if the speed isn't right up to what it should be for orbit, the retro rockets can be fired to bring us back in.

Question: The attitude change and the horizon centers seem very similar to the Discoverer program. Are you following that very closely?

Grissom: We try to follow all programs as closely as we have time for.

Question: At what state of the flight was the escape tower jettisoned?

Shepard: The escape tower is jettisoned shortly after staging. In the case of the Atlas of course that means—

Question: At half staging?

Shepard: When the nose drops off. Shortly after that time.

Another means is provided in addition to this for separating the capsule from the Atlas. It is one which doesn't actually show when the capsule is joined to the Atlas. It sits down underneath the grounded body of the Atlas and it is a much lower thrust rocket. At that time of course you would be in an environment which is close to a vacuum.

Question: I would like to know the maximum number of transverse G's you expect to take on your re-entry, and for what period of time.

Schirra: For the normal mission, where nothing would go wrong, where we didn't have to use any escape mechanism, the maximum G's would be between 8 and 9. This would be on re-entry as well as on boosted flight into orbit up to orbital insertions. Of course, it would then reduce to zero. The impact G is on the order of about 18 to 20 G's; somewhere in there.

(EDITOR'S NOTE: G is a unit of measurement of acceleration as so many times the acceleration due to gravity.)

Question: How long have you been taking 8 or 9 G's?

Schirra: I had better look down the line for that one.

Grissom: Do you mean how long will you sustain that 8 or 9 G's?

Schirra: It is not very long. It is probably about 10 or 15 seconds at the most, at the peak. This would be some level above, say 5 or 6 G's, which is a very low order of G, particularly in the position we are in.

Question: You have seen the X-15. What do you think of that half rocket half airplane?

Glenn: Well, we have just completed talking with some of the people at Edwards AFB about the X-15 and re-

ceived a real good briefing up there. We talked with the pilots, Scott Crossfield and Bob White. Our feeling, I think, pretty much matches theirs, that these are complementary programs rather than competitive programs.

We feel that there is a great deal to be learned in both programs. Certainly we will have a cross-feed of information back and forth that will benefit both programs. The information that both programs are getting is needed for the design of better future space vehicles.

We each have our areas of specialization, of course, in the information we are going for. But certainly we are not competitive programs. We are complementary programs, that is the way we look at it. That is the same way the pilots up there look at it.

Question: Do you think that the first true space man will be one of you, or the man who flies the X-15?

Glenn: This is something I am glad you brought up on the "first" thing. This is something we all feel very strongly about. We are trying to more or less play down the idea of who will be the first man. I know that this is of big interest to the press and so on, but we feel that we are all extremely fortunate to be just at this time in history, where we can take part in such a big venture as this.

We feel that is much more important than whose name happens to be on the first ticket to go.

As far as which program we would consider to take the first man in space, I don't know. We are both getting the same altitude. We will be the first into orbital flight with this. They don't plan orbital flight with the X-15 right now, of course. So you can differentiate it that way, if you would like. As far as who gets to the altitude first, I don't know. This seems to me to be relatively unimportant.

Shepard: Could I add to that? That was a very fine comment, I think. I think something here is very pertinent to your question, related directly, really, in that we can't afford to quibble about this sort of thing. We are concerned with advancing the technology. I think if you want to speak seriously about advancing technology and racing with anyone, that we have other considerations outside the continental limits.

Question: How will the first man be selected? What will be the determining factor?

Powers: I don't think we have an answer for you right now. If these Astronauts maintain their current highly competitive levels of capability, it could well go to lot.

Question: Have any of you any ideas as to which simulation training program you consider the most effective and most important; that is, work with the side stick controller in the air-bearing chair setup, or centrifuge work, or a combination centrifuge-periscope, or what part of it? The work with the control system or what?

Cooper: I think they all are very important. I think that each one has had its area of importance in training. It would be hard to say any one particular one might be the very most important one.

I think that for the mission simulation, as far as feeling the G forces in the practice of controllability, one of the best ones we have had so far has been the centrifuge. However, there will be others that will be equally as important and equally as good training.

Schirra: The first thing I think of is the fact that not all simulators are ready. So as a result we are doing parts of it. For example, in the centrifuge we use the side-arm controller coupled into an analog computer, and then experience G's and try to find out at what work level we could perform, or at what task level we could perform, while undergoing G's.

A further step to that would be the illusions and sensations on this air-bearing couch, for example, again using the side-arm controller, tying the periscope together with the instrument presentation. So each one is adding. And as they become available they will become more interesting until we have the whole capsule to practice with.

Question: Are there any plans to integrate all of these things together, to try to get as close control simulation as possible up to the point of—

Schirra: Within reason, yes.

Question: General Ritland, in enumerating the areas of responsibility you didn't mention, I think, recovery systems and techniques. What agency has the responsibility on that?

Powers: We have a joint agreement with the Defense Department. Our recovery force is under the Fourth Destroyer Flotilla, United States Navy organization, under the command of Admiral Smith, of Norfolk. It is a joint force.

Question: That is the recovery operation. But what about recovery systems? We are confronted with the problem of getting one or more of these fellows to back out of this circle up there. So far, as far as I know, we haven't managed to get a milk bottle back.

Powers: McDonnell is manufacturing the capsule.

Question: Who is minding the store as far as trying to work out a foolproof system?

Powers: NASA, the Space Task Group. We have come about as close as anybody has come to recovering any object from orbit in our "Big Joe" shot in September at Cape Canaveral. We got near the velocities that we would normally encounter in re-entry from orbit. This was the first of a series of steps in trying to prove out the system.

Question: You are leaning heavily on the Discoverer recovery program for information, aren't you?

Powers: We are acquiring as much data as it is possible to get from it. We want to take advantage of all they are learning.

General Ritland: I think this is more in the environmental area, rather than a direct application of hardware to the Mercury capsule. We are not testing any specific components but getting information on the environment and procedures that could apply.

Shepard: Do you think we should explain before we leave this that we are not considering using the flying trapeze method? When we talk about recovery, we are talking about after the landing. Possibly you are talking about recovery coming back in. We are speaking of the capsule itself. As just pointed out, this is under the direction and guidance of the Space Task Group of the NASA, McDonnell being the prime contractor on it.

Question: Can you give us any idea on when you will have the first manned missile flight?

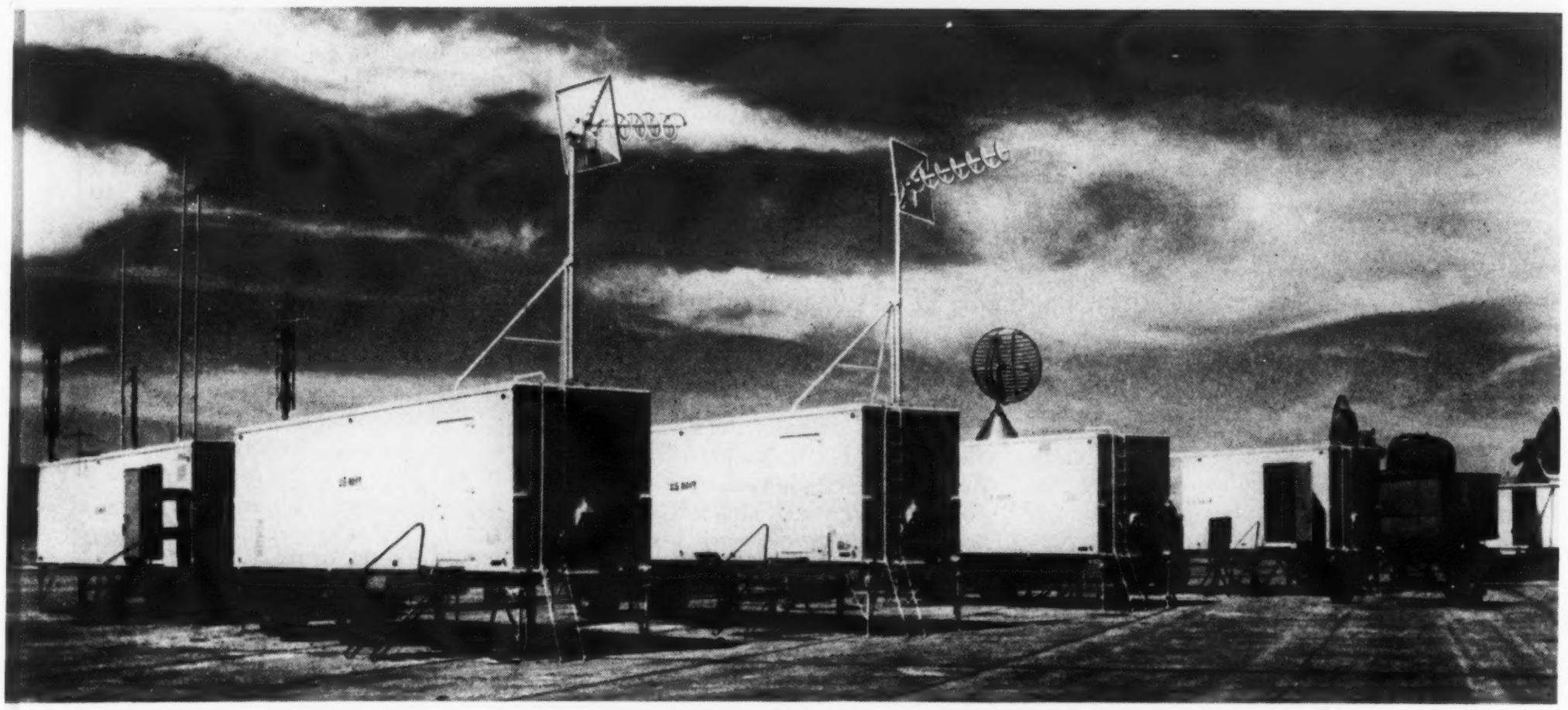
Powers: I couldn't begin to give you a date.

We must prove out the capsule, push farther down the road on the astronaut training, get more range facilities, and then we will fire it. A lot depends on the upcoming series of "Little Joe" tests. We may or may not run an additional "Big Joe."

(*Continued on page* 54)

point mugu

MOBILE RANGE INSTRUMENTATION SYSTEM



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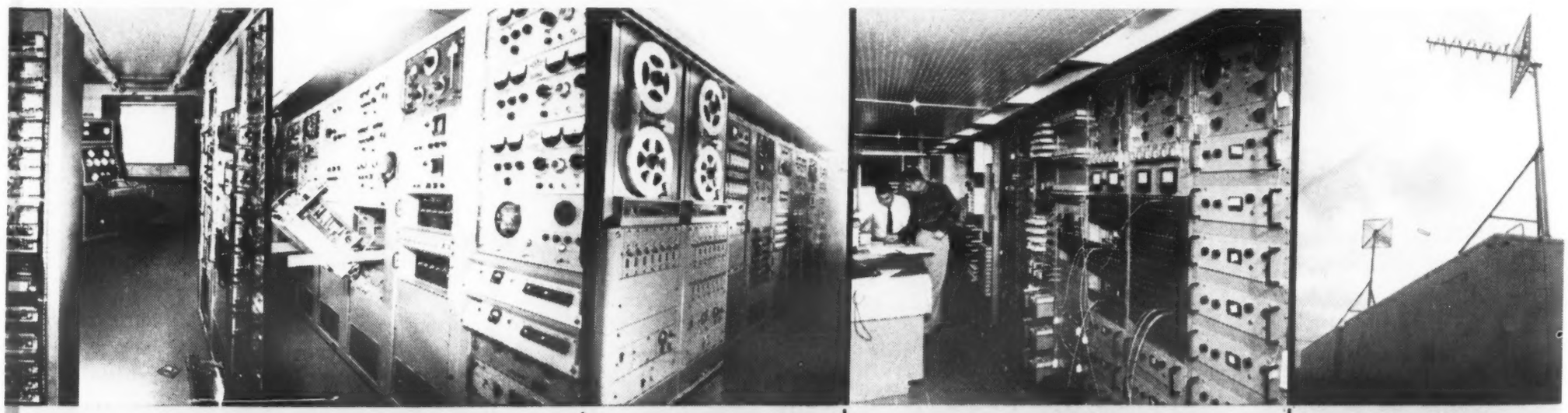

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I LIKE TO TALK ABOUT "HAMS"

by WILLIAM J. LAHIFF, W2IVT

Liaison Engineer, Lewyt Manufacturing Corp.

BEFORE STARTING this article, I would like to suggest, as background information, the story entitled "The Radio Amateur—America's Secret Weapon" by Brigadier General John Bestic, which appeared in SIGNAL, December 1958. It is significant, timely and worthy of anyone's time interested in "Ham Radio."

During the past few years certain trends which various amateur groups have drifted toward have not always been in keeping with principles and procedures most beneficial to themselves or the state of the art. The trend toward mere "rag chewing" with purchased equipments tends to reduce the prestige of the amateur and materially lessen his value to the military, one of his greatest assets.

However, many of these trends while truthful to a degree, are often completely exaggerated.

For example the following quote made recently by a ham radio operator: "While a few venturesome souls have explored the wide open spaces of six and two meters and above," is in my opinion a misrepresentation without fact.

The six and two meter bands in the metropolitan areas are actually crowded. The efforts of some of the more serious experimenters to obtain a few kilocycles on the low end of the 144 megacycle band for the exclusive use of CW for Scatter and Moon Bounce communications bear witness to this fact. Many amateurs are using the 220, 420 and 1215 megacycle bands not only for verbal and code communications but television, as well. The amateur population does decrease with increasing radio frequency, due to technical difficulties of which I will write more later. Perhaps the geographical location of the originator of the above quote has lead him to a false assumption.

It has been stated also, that amateurs are "utilizing techniques and procedures virtually unchanged since the days of Hiram Percy Maxim." Well, how wrong can one be? As far as the authenticity of this statement is concerned, may I refer our readers to the article by Lt. Gen. James D. O'Connell, USA (Ret.), former Chief Signal Officer, which appeared on page 16 of the July 1959 issue of SIGNAL Magazine, "The Amateur and the Military Affiliate Radio System."

It is gratifying to note that the average amateur today is in touch with present techniques and through personal desire or guidance from a friend strives to advance his horizons in all phases of amateur activities.

Any idea that the amateur is sadly out of touch with present techniques, is not true. As a case in point, I have introduced a number of teen-age boys to ham radio via the Novice route and although their ham experience does not exceed two years they are conversant with Forward and Tropospheric Scatter and the other modern techniques. Not that they daily engage in communications or experimentation with Scatter, Multiplexing or Diversity systems, but their academic interest is high and they eagerly assimilate information available in the technical periodicals. D. S. Kennedy & Co. or Gabriel Co. would surely be intrigued by a purchase order issued by 16-year old John Q. Ham for a 60-foot dish to be erected on a New York City apartment roof-top. Also, the ham has only one voice or key and consequently does not have a requirement for multiplexing. Enough hams are now engaged in radio teletype operation so amateur publications feel it proper to maintain a monthly column devoted to the technique.

The number of true experimenters in the amateur ranks has always been small when compared with the total number of licensed amateurs. Although the rank and file do not continuously engage in experimentation, some of the total information generated does rub off on each individual. Probably one of the greatest amateur contributions to military communications science occurred during the early days of World War II, when hams were avidly sought by radar suppliers because of their UHF (then) experience. Not all hams had previously experimented with and built five meter equipments, but they were all aware that a two-inch length of wire exhibited considerable inductive reactance at 200 megacycles, a fact that many engineers who had spent a life time developing lower frequency equipment had yet to learn.

The number of radio amateurs who engage in experimentation is determined by many factors. Interest is one, and I believe that most hams at some time or other have ideas they would like to prove.

Another factor is financial status. Many a bright idea has gone down the drain because the ham could not afford the money for necessary equipment. Amateur activity in the Microwave bands has been retarded by the high cost of microwave components and test equipments. These components can be fabricated, but few hams have the necessary machine tools, etc. But to prove the exception to the rule, an amateur group, the San Bernardino Microwave Society has developed microwave components fabricated from tin beer cans—an exceptional feat, because hams in general are a rather sober, serious type.

Location of the ham station is a major factor. The city dweller cannot put extensive antenna arrays on his apartment house roof-top nor run one hundred feet of waveguide from the roof to his apartment. He also cannot participate in Scatter work because of high ambient electrical noise. The ham on a Kansas farm, because of the sparse amateur population, cannot find a local ham to participate in microwave communication experiments.

Time is another factor. Back in 1939 the ham could build the simpler transmitters and receivers of that era in a few evenings. In fact, the breadboard equipments of those days were constantly changed and circuits were also changed on a weekly basis. The ham designing and building the multi-tube (or transistorized) complex equipments necessary today is confronted with shielding problems (brake and shear in the living room) spurious radiation problems (see any Stoddard equipments in surplus?)

and a host of other considerations amounting to a three or six months building period.

The fact that radio amateur stations are composed mainly of commercially produced equipments is not conclusive proof that the amateur owner is not an experimenter. Many articles published in the amateur journals bear titles such as "Updating the Super Pro." "Better Selectivity for the HRO," etc. If you visit the local radio dealer and look over the used amateur equipment for sale you will observe that many commercial equipments have been modified in the interests of circuit improvement or experimentation.

As can be seen, it has become increasingly difficult for the amateur radio operator to participate in the many facets of electronics. The amateur has used his own money and facilities in the past, but present day technological advances demand greater expenditures and improved facilities if the amateur is to continue his contributions to the military effort to the same degree he has in the past.

In my opinion the real need of the military is for technicians rather than communicators. The communicator training period is relatively short, whereas it takes years to produce competent technicians. Therefore, it seems logical that the military agencies should provide aid to the amateur in the form of better technical information, aid in obtaining equipment and establishment of particular facilities necessary for amateur experimentation.

As the military agencies have already established MARS to encourage amateur training tailored to military needs, it appears that MARS is geared to assume additional responsibilities as follows:
(1) Generate papers describing current electronic techniques used by the military. The articles should include schematics, design criteria discussions, advantages and disadvantages of the system. Available papers should be advertised in the amateur periodicals, and should be available to the amateur upon request, at no charge. (2) Contract with competent technical authors to write articles for the amateur periodicals to acquaint the amateur with current military communication techniques. (3) Establish a technical information service to which amateurs interested in specific techniques could apply for information. (4) Make available to the amateur on a no charge, loan or nominal charge basis (remembering that some young hams have a weekly allowance of less than five dollars), special surplus equipment such as waveguide components, microwave tubes, test equipments, etc. Original amateur experiments on UHF (5 meters) were conducted with simple gear for local contacts. It is conceivable that a program of this sort would interest amateurs in microwave operation, even under the limiting conditions detailed previously. (5) Set up facilities at military establishments for use by amateurs in Scatter, Moon Bounce and other experiments requiring low noise locations and the types of antenna arrays the amateur could not afford. Amateur radio clubs in the vicinity of military bases (where it is feasible to supply housing and antenna facilities) would be invited to build and operate the additional required equipments.

The establishment of the Novice Class license in the present form for amateurs has proven sound and has resulted in a large increase in the number of amateurs without materially reducing amateur standards. I believe the average beginner is intrigued by the possibility of communication over long distances by radio and without this romantic aspect fewer people would develop interest in ham radio. Any idea to restrict *all newcomers* to, say, two and six meters for a period of three to five years would certainly reduce drastically the number of new applicants, leaving fewer amateurs of draftable age.

In conclusion, let us not forget the terrific services rendered by amateur operators in time of national emergencies, in peace or war. Let us also pay a tribute to them for their phone patching accomplishments wherein amateurs take messages from inaccessible areas of communication and link loved ones with home.

No—the secret weapon is not obsolete. The radio amateur has done remarkably well in this age of increased tempo and complexity in technology. "Breakthrough" is not achieved by the garret inventor of yesterday, but by team work. Government direction, funds, and large commercial engineering laboratories are necessary to accomplish the dictated technological advances necessary tomorrow. The concept has changed —we cannot wait for "normal development" of our technical arts as we did in the past. And so it is with the radio amateur, the concept is changing. If the military desires to keep the secret weapon shiny, bright and ready for use, the radio amateur must be included as a member of the team.

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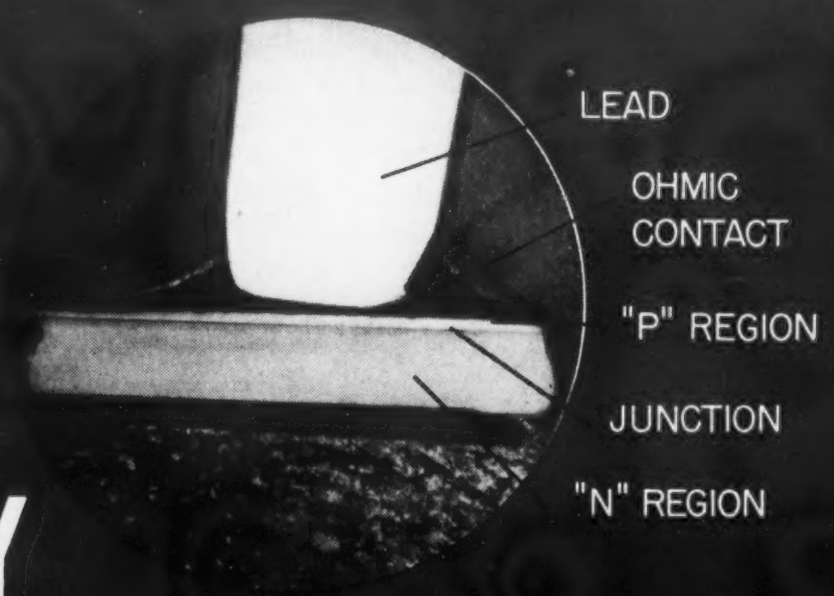

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by Major General Harold W. Grant

COMMUNICATIONS TOMORROW

Director of Communications - Electronics, HDQ., U. S. Air Force

IMPLIED IN THE challenge of tomorrow is the problem of defining our future communications systems objectives and identifying the most promising avenues of endeavor to meet them. As a senior member of the "Board of Directors" of an organization responsible for operating the largest communications system in the world, I feel qualified to make some observations concerning factors which will influence the shape of things to come in "Communications —Tomorrow." I ask your indulgence if my remarks appear to be flavored by my Air Force experience; even so, much of what I have to say will also apply generally to communications systems of the other military services.

You are all well aware that communications systems of the world and especially those of the U. S. military have grown rapidly since the end of World War II; they are continuing to expand at an astounding pace. You will be interested to know that in the Air Force alone the 1959 communications-electronics budget was 10 times that of 1950—a thousand percent increase! This explosive growth in military communications can be partially attributed to the greater reliance that must be placed on electronic devices as the demands for speed and accuracy exceed human capacity. But even more important, and less often appreciated, is the greater and greater need for much more facile and responsive communications systems to permit absolute control of weapons and forces now deployed and operating in a vastly expanded volume of space. This greater need stems directly from the lethal nature of contemporary weapons, the necessity for controlling the release of these weapons at the highest level of government and the requirement for rapid and coordinated delivery of weapons to their targets should such action become necessary. This awesome military responsibility demands fool-proof, ultra-rapid and precise exchanges of intelligence, operational data and critical command decisions on a global basis.

This fact dictated the extensive improvements we have made in military communications systems over the past decade and is the reason the Air Force is now engaged in a program known as "Quick Fix" designed to utilize proven techniques and the most advanced equipments immediately available to bring our system up to the present day state of the art, in the shortest period of time.

However, as the time for decision and reaction is further compressed with the rapid development of new weapons, most of the communications techniques employed today fall short of the requirements of tomorrow's command and control systems.

In other words, the Air Force believes that it is no longer enough, in fact it is no longer consistent with the plans for our country's survival, to put together by piecemeal methods a communications system that aims merely to catch up or keep pace with current military requirements. Rather we must anticipate further needs and future weapons. We must be ready for them *before* they have completed the journey from the drawing board to the factory, and actually come into being. To meet the anticipated requirements of the future air weapons is the mission of a program known to most of you as 480-L or the AIRCOM Modernization Program.

Urgency of Modernization

The Air Force believes that it is a matter of the utmost urgency to modernize its communications network around the world. We need only balance a simple equation. On either side arrange the factors of absolute destructive power, absolute range and at least approximate accuracy of weapons. Place alongside them the factor of time. Now we see that the first three factors will cancel each other out, and we are left with the all-important, the critical factor of time. What does this mean? It means that, in a broad sense, time has become a weapon. It means that, when the other factors are balanced out, the side that is given time, that gains time, that uses time more efficiently, will be the stronger. And all this is wrapped up in the art and the proper use of communications.

I would like to quote a few remarks from a recent talk by General LeMay given before the 1959 convention of the Armed Forces Communications and Electronics Association in Washington ("Military Communications in This Era," August 1959 SIGNAL). He said—"The world as man once knew it is shrinking at an alarming rate. . . . It took the Pilgrims 54 days from the time they left England to sight Cape Cod. Modern ships make the journey in five or six days; jet aircraft do it in a matter of a few hours; missiles could do it within minutes. Relatively speaking then, if one were to consider the earth in Pilgrim days as the size of a basketball—now, it is the size of a pea." Referring to projected Ballistic Missile Early Warning Sites, General LeMay explained that these sites were designed to give this country as much warning as possible of a missile attack. This warning, he said, will be 15 or 20 minutes at best, of which a minute and a half is allocated for communications. And to close this quotation from General LeMay: "When minutes spell the difference between life and death of a nation, every second—in fact, every micro-second counts. Again, communications is the key, and again, it must be accurate, rapid and reliable—there is absolutely no margin for error."

Fifteen minutes—this is the brief interval that the Air Force has to work with. It's not very much. It's the time we might take, say, to walk to the corner drug store and back. Or listen to a radio news round-up. Within this interval, in the event of an attack, our planes must be in the air, our missiles and counter-missiles launched, our counter-measures set in motion, our populations warned to take shelter. A large part of these defense and retaliatory measures must be coordinated across the world by AIRCOM. Is it any wonder that we in the Air Force have an urgent sense of the job to be done in creating a communications network that will meet our needs today—and tomorrow?

While the demands of tomorrow's

(Continued on page 32)

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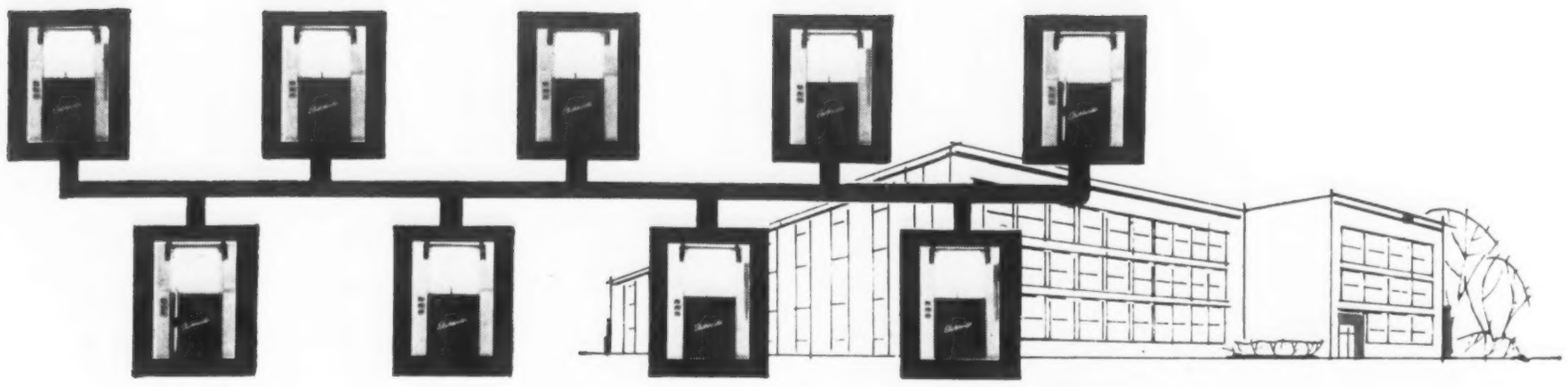

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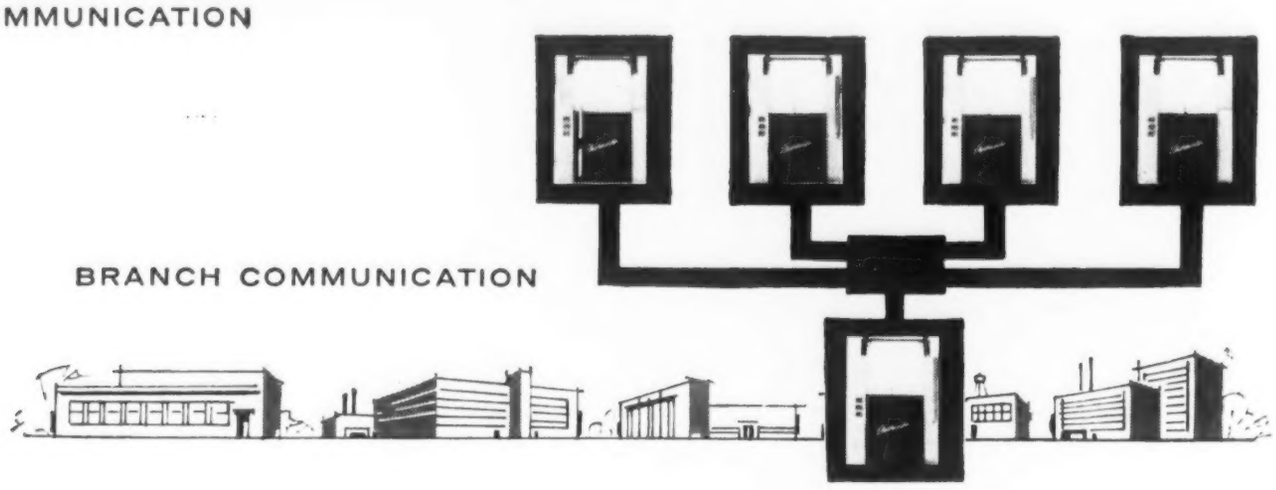

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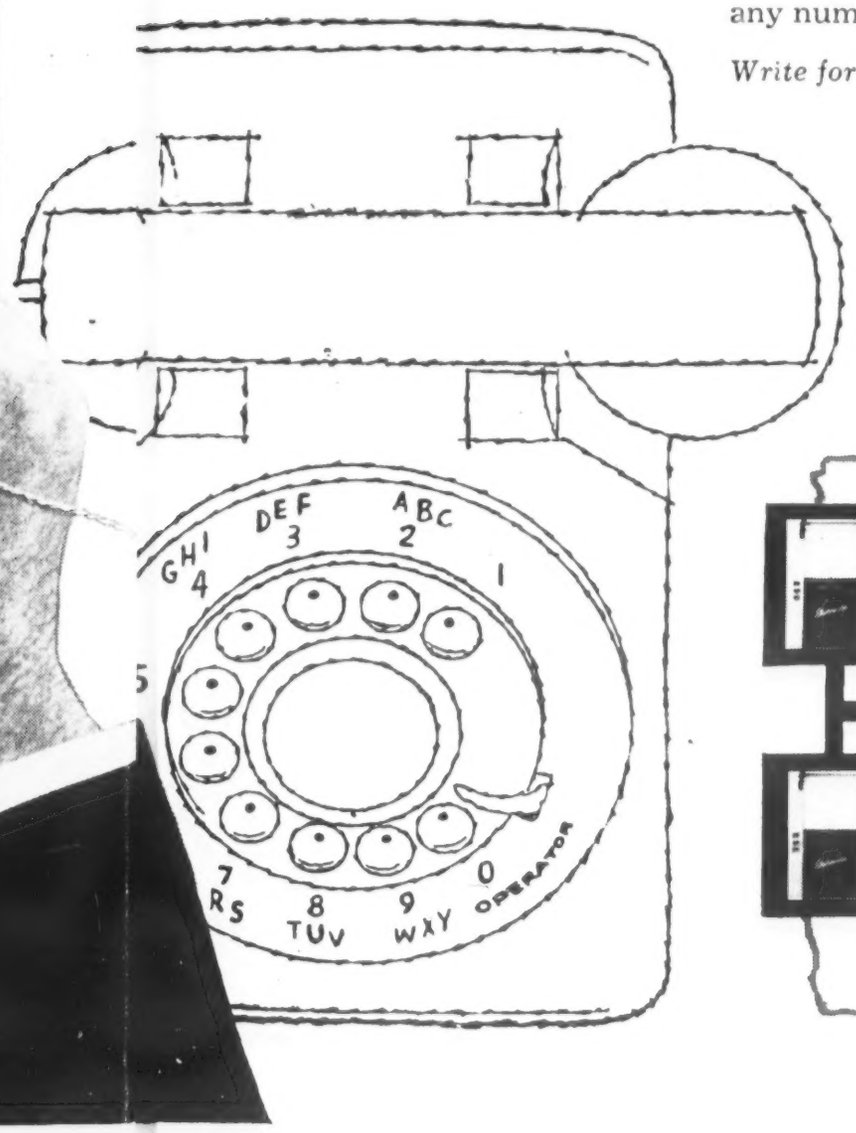

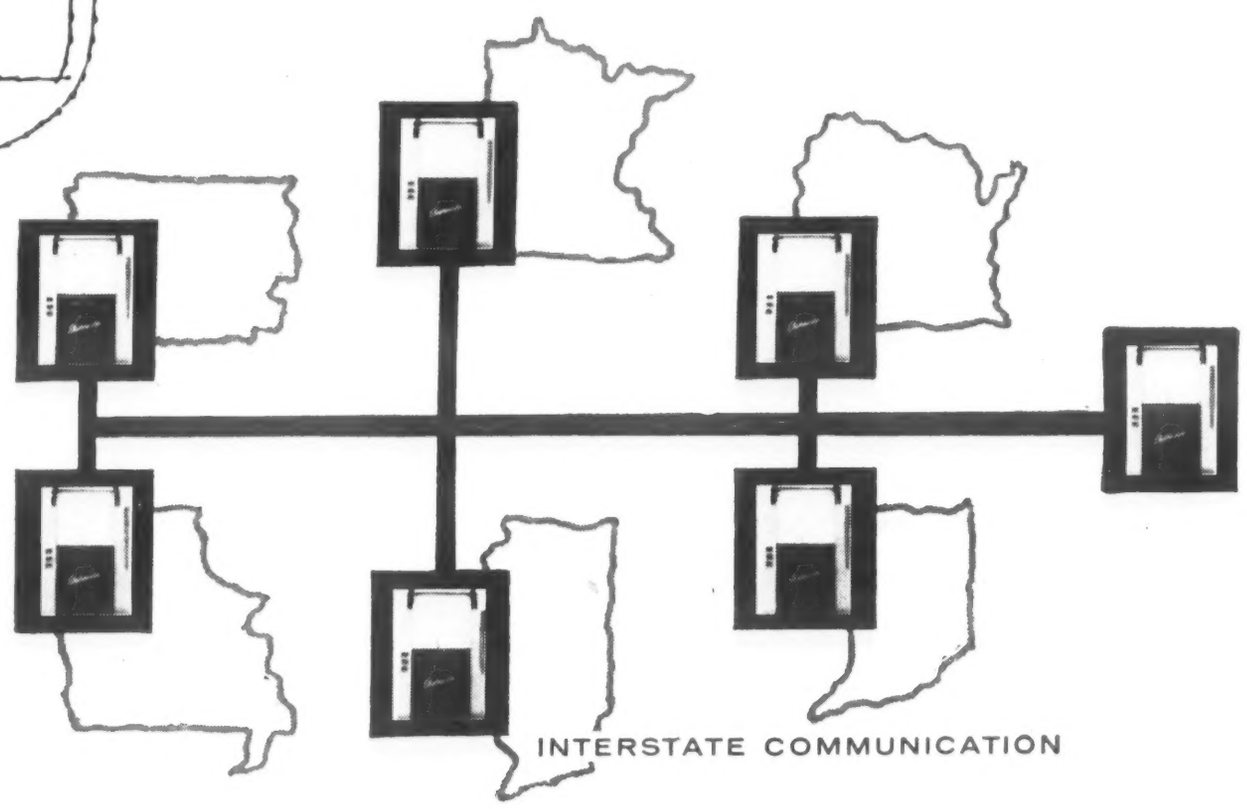

INTERSTATE COMMUNICATION

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Protector of Small Business

by DONALD A. HIPKINS, Deputy Administrator
Small Business Administration

FOR SOME YEARS THERE has been an organizational unit of the Federal Government charged with certain responsibilities to assist small business. At one time this unit was in the Department of Commerce. During World War II the Smaller War Plants Corporation was established to assist small companies in obtaining defense contracts. During the Korean conflict the Small Defense Plants Administration was set up with somewhat similar functions.

On July 30, 1953, the Small Business Administration was created as the first peace time agency delegated with the responsibility of advising and assisting small business in a variety of fields.

This first legislation gave us a "life" of two years. In 1955 we were extended for another two-year period, and in 1957 a one-year extension was approved. However, in 1958 the Congress passed a bill which made the SBA a permanent agency of Government.* We are one of the independent agencies and our Administrator reports directly to the President.

Under current legislation our basic missions as assigned by the Congress are:

(1) To insure that "a fair proportion of the total purchases and contracts for property and services for the Government (including but not limited to contracts for maintenance, repair, and *construction*) be placed with small-business enterprises, to insure that a fair proportion of the total sales of Government property be made to such enterprises, and to maintain and strengthen the over-all economy of the Nation";
(2) To assist small business with their technical and management problems;
(3) To make loans to small business;
(4) To make loans to victims of natural disasters; and
(5) To license and supervise the operation of Small Business Investment Companies under the recently passed Small Business Investment Act.

In addition to the foregoing, the SBA, in the 1953 Act, was assigned the function of defining small business. This section of our Act was revised in subsequent legislation and now reads as follows:

"SEC. 3. For the purposes of this Act, a small-business concern shall be deemed to be one which is independently owned and operated and which is not dominant in its field of operation. In addition to the foregoing criteria the Administrator, in making a detailed definition, may use these criteria, among others: Number of employees and dollar volume of business. Where the number of employees is used as one of the criteria in making such definition for any of the purposes of this Act, the maximum number of employees which a small-business concern may have under the definition shall vary from industry to industry to the extent necessary to reflect differing characteristics of such industries and to take proper account of other relevant factors."

I am sure it is apparent that for the first five years of our existence, operating as we did on a temporary basis, we had many problems. Long range planning was difficult, and we had numerous personnel problems. We feel that our current legislation is the best we have ever had and that no substantial revisions are necessary.

In order to accomplish the functions of SBA, we have an office in Washington, 15 regional offices, and about 40 branch offices, including one each in Alaska, Hawaii and Puerto Rico.

One of the tools designed to insure that small companies get a "break" in obtaining Government contracts is the so-called "set-aside" procedure for which our Act provides. Under this procedure certain procurements, or portions thereof, are set aside for exclusive bidding by small companies. The value of these set-asides has risen from about $300,000,000 in Fiscal Year 1954 to over $1 billion in Fiscal Year 1959.

It is recognized that this program has not reached its full potential. The basic problem is that of coordinating small business programs with the primary responsibility of the purchasing offices. Therefore, the problem is one of continued education.

The joint set-aside program is carried out by the SBA in cooperation with those Government agencies which account dollar-wise for most of the Federal Government's purchases. Section 15 of the Small Business Act empowered the SBA and Government contracting officers to set aside proposed procurements for competition among small business concerns when such action was in the interest of maintaining or mobilizing the Nation's full productive capacity, or in the interest of war or national defense programs, or in the interest of assuring that a fair proportion of the total purchases and contracts for property and services for the Government are placed with small business concerns.

The program is directed toward the discharge of our responsibility to see that a fair proportion of total purchases and contracts for supplies and services of the Government shall be placed with small business concerns.

To carry out the joint set-aside program, the Small

(*Continued on page 30*)

* See "Senator Saltonstall Talks About Small Business and National Security," January 1958 SIGNAL.

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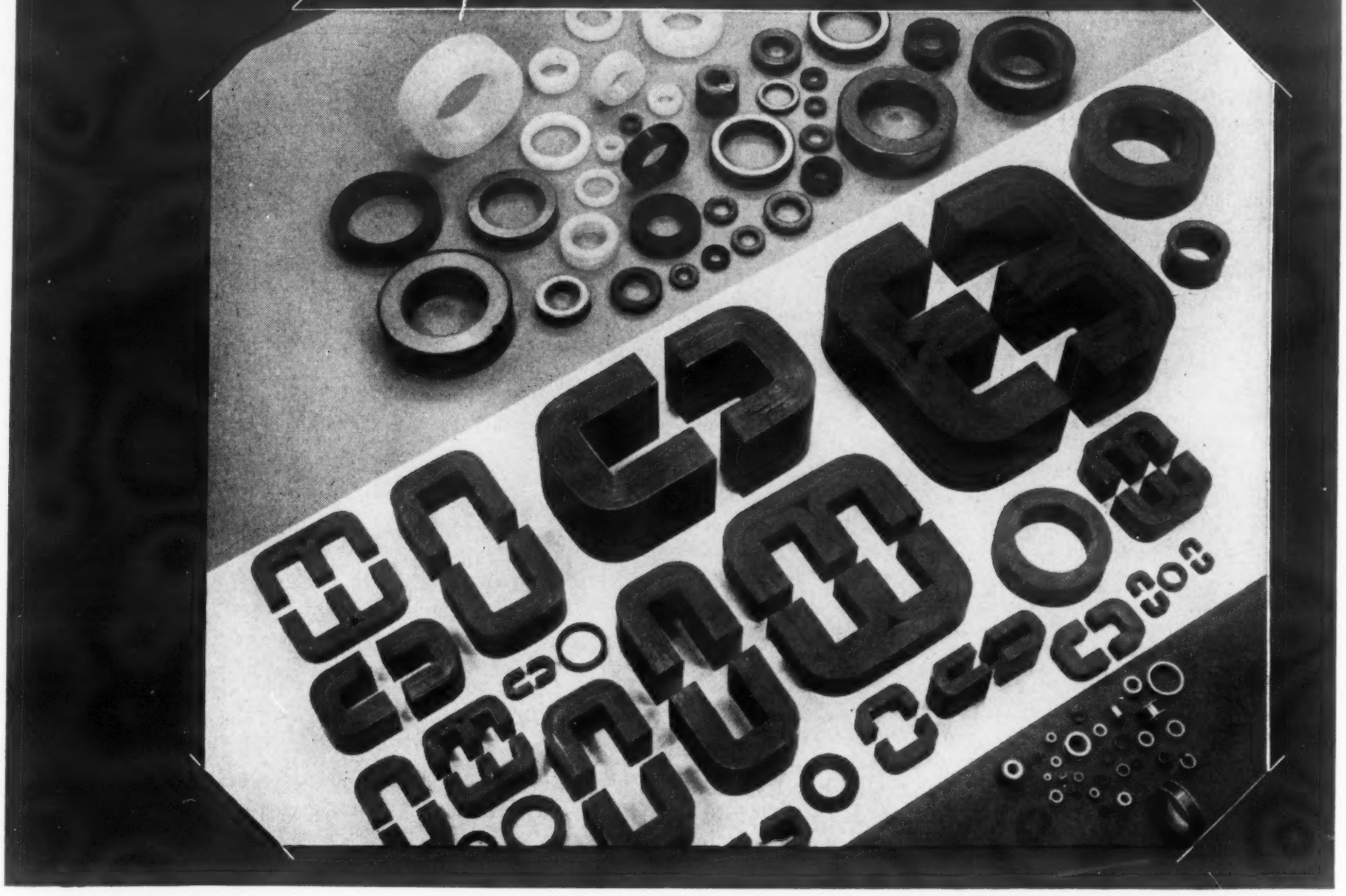
Aluminum and Plastic Cased / Types C, E and O / Stainless Steel and Ceramic



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Operation SBA

(*Continued from page* 28)

Business Administration assigns representatives to the major Government purchasing offices. There, in cooperation with procurement officials, they jointly screen proposed purchases of individual items or classes of items to determine whether small firms can supply the items or services and evaluate the small business competition. When the Small Business Administration representative determines that sufficient small business competition can be obtained, he recommends that the procurement be totally or partially set aside for competitive award to small business concerns. If this request is denied, he has the right by law to formally appeal the decision to the Secretary or head of the Government agency involved.

The 120 Percent Rule

When an entire procurement is restricted to small business firms, that is, set aside for exclusive award to small business, any bids received from large business concerns are considered as non-responsive. Where only part of a proposed purchase is set aside for small business, small firms compete with all other businesses that bid on the contract, large and small, for the non-set-aside portion of the procurement in order to be considered for negotiation of the set-aside portion. To qualify for negotiation of the set-aside portion, the bid entered by a small business firm must be within 120 percent of the highest unit price at which the award is made for the non-set-aside portion. Negotiation is then conducted with the small business firms which are determined to be responsive and which qualify under the 120 percent rule, beginning with the firm which submitted the lowest bid on the non-set-aside portion. When only one award is made on the non-set-aside portion, the set-aside portion must be awarded at the same unit price. When the non-set-aside portion results in multiple awards, the set-aside portion is awarded at a unit price equal to that of the highest price awarded on the unrestricted portion.

The SBA set-aside program assures that small firms will be awarded contracts on those procurements earmarked for exclusive award to small business. Furthermore, when a proposed procurement is set aside on a partial basis, the opportunity for awards is, in fact, double; one with respect to the set-aside portion, and one with respect to the non-set-aside portion. It further gives small business the opportunity to bid or quote on smaller quantities, since the partial set-aside action has the effect of dividing the procurement into at least two parts. This program serves to strengthen the national economy inasmuch as it broadens the procurement base for the Government by encouraging small business participation in Government contracts.

Weapons System Concept

We are also vitally interested and actively engaged in assisting small companies to obtain subcontracts with the large Government prime contractors. The use of the so-called Weapons System Concept of procurement has made it necessary for us to increase our efforts on behalf of small business in the subcontracting field. With regard to the Weapons System Concept of procurement, I should like to read a paragraph from our Semi-Annual Report for the six-month period January 1 to June 30, 1959:

"The owners of small businesses were concerned over the increasing use of management contracts and weapons system concept of contracting utilized by the military services. The Senate Select Committee on Small Business held hearings on this subject on April 22, 23 and 24. A number of defense contractors appeared at these hea
ings. The House Armed Services Investigations Su
committee also held a hearing on June 17, 1959,
negotiated procurement and the use of the weapons sy
tem. The Small Business Administration is continui
to study these problems in an effort to develop reco
mendations for the procurement agencies, but the over-
impact of these changes is not yet clear. It is clear th
increased use of weapons system contracting tends
place much Government procurement beyond the rea
of the set-aside programs and other programs of t
Small Business Administration which are applicable on
to prime contractors. For this reason, if for no other, t
subject merits continued intensive study."

I have endeavored to cover rather briefly the pr
grams of the SBA in which I thought you would be mo
interested. There are many others. In the area of Pr
curement and Technical Assistance we:

- Guide small firms to areas where competition
  needed.
- Counsel on procurement problems.
- Help develop subcontracting opportunities for sma
  firms.
- Bring Government purchases to the attention of sma
  firms.
- Assist small firms to obtain research and develo
  ment contracts.
- Assist small firms through our Products Assistan
  Program.
- Assist small firms to procure timber and other co
  modities and items disposed of by the Gover
  ment.
- Participate in the surplus labor and rural develo
  ment programs.

SBA Financial Assistance

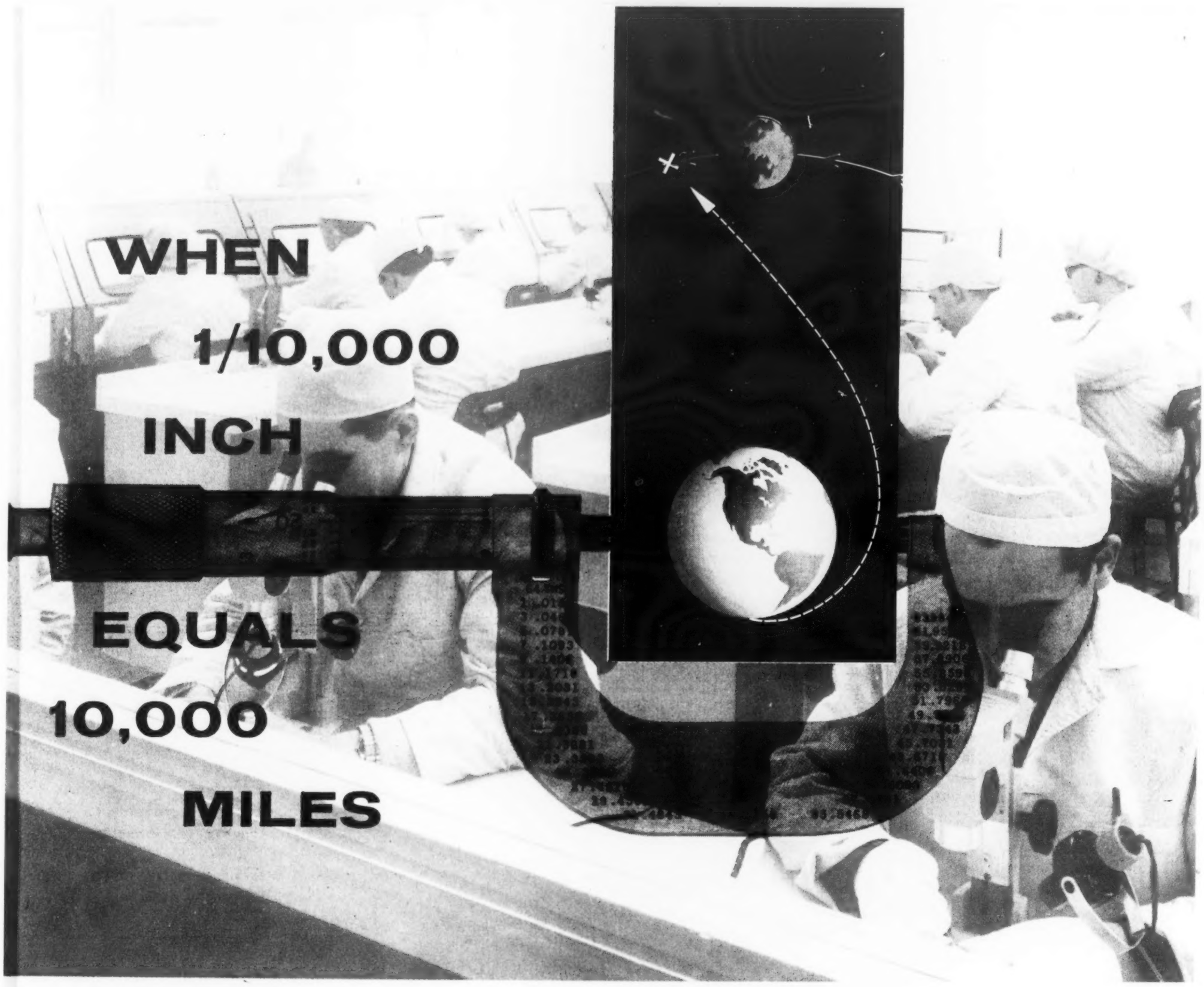
In the area of Financial Assistance, the SBA can mak
loans to worthy small-business concerns which meet re
sonable credit requirements when private financing is n
obtainable. These loans must, of course, be for what w
would consider sound business purposes. We can pr
vide up to $350,000 for any one borrower and our loa
can be for terms of up to ten years. They can be mad
either directly by SBA or in participation with bank
As a matter of fact, approximately two-thirds of the mo
than twelve thousand loans we have made thus far hav
been made in participation with banks. This is in kee
ing with the intent of the Congress that the Small Bus
ness Administration will not compete with private lendi
institutions but will supplement them.

Our financial assistance program also includes loa
for the repair and rehabilitation of property which ha
been physically damaged or lost as a result of natur
disasters. These disaster loans may be made to bo
business and non-business entities and, in fact, a gre
many of these loans have been made for the rehabilit
tion of homes. Disaster loans may also be made to smal
business concerns which have suffered substantial ec
nomic injury as a result of drought or excessive rainfa
where such disasters have been declared by the Preside
or the Secretary of Agriculture.

Last year the Congress passed what is known as th
Small Business Investment Act of 1958. This legislatio
is designed to fill a gap in small business financing.

Equity capital and long-term loans for growth and d
velopment purposes have never been readily available t
small business. Commercial banks furnish short and i
termediate-term loans but not venture capital and lon
term credit. Existing institutions which could provi

(*Continued on page* 32)



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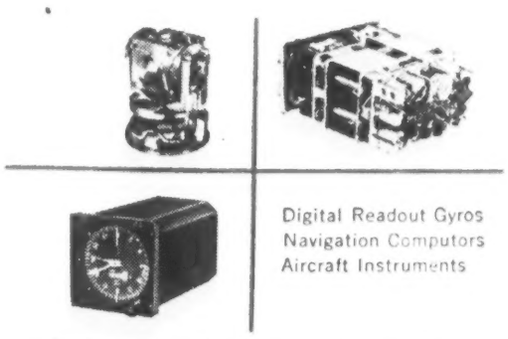

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Operation SBA

(*Continued from page* 30)

venture capital are not able to assist smaller firms since the cost for public sale of securities is disproportionately high to small business issuers. The Small Business Administration, under its regular lending program, can assist small business concerns with intermediate-term loans but cannot provide the equity funds needed for growth and development. As a result, there has been no institutional source to which small business could turn to meet its capital needs. It is this gap which the Small Business Investment Act of 1958 is designed to fill.

The stated purpose of the Small Business Investment Act is to improve the national economy in general and the small business segment thereof in particular by establishing a program to supplement the presently inadequate sources of private equity capital and long-term loan funds which small business concerns need for the sound financing of their business operations and for their growth, expansion and modernization.

Congress has directed that the program be conducted with a maximum participation of private financing. Further, it is the expressed intention of Congress than any financial assistance provided by the Government in this program shall not cause a substantial increase in unemployment in any area of the country, through indus pirating or otherwise.

Under the Small Business Investment Act, the Sm Business Administration will license and regulate sm business investment companies operating under the A The agency is empowered to charter private small-bu ness investment companies in States where such organi tions cannot be organized or operate effectively un State law. These small business investment compan are to be devoted entirely to financing small busin enterprises.

The Small Business Administration will not be prov ing long-term financing to individual small businesses der this new legislation. Instead, it will assist in creation of private small-business investment compani and will make loans to them and to State and lo development companies.

These companies, in turn, will make long-term nancing available to individual small concerns, or p vide them with equity-type financing. Thus, the Fede Government will have no direct relationship with sm concerns under this program. The responsibility for vesting in small business concerns, or making long-te financing available to them, rests with the small-busin investment companies.

Communications Tomorrow

(*Continued from page* 25)

communications systems will assuredly tax our national scientific and industrial effort as never before, we are also mindful of the growing costs of such an enterprise and its consequent drain on the national economy. It is becoming more and more apparent that the communications-electronics phases of weapons systems development represent a rapidly increasing share of the total cost of national weapons. Balanced against these rising costs, is the undeniable fact that to perform these essential functions by other than electronic means is impossible. We are offered no other choice but to employ these complex, and often expensive, techniques. What we must do is exert maximum cooperative effort to avoid duplication of systems between the Services. But I must observe, at this point, that the requirements for communications systems of the military departments do not look alike and the facilities employed to support these requirements cannot come from a completely common system. Even if the services were placed in a single uniform, as has been urged by the Air Force for several years, separate communications complexes would still be needed to respond to the unique requirements of the particular weapons systems of which they are an integral part. I hasten to emphasize though that our future complexes must be intelligently integrated, even as our contemporary systems are being increasingly integrated into a Joint Communications Network. This is imperative if we are to insure economy of operation and make certain that vital traffic continues to flow unimpeded between the systems of the three military services.

I strongly feel, however, that if we are to accomplish our program objectives, at a price we can afford, we must strive to obtain technological breakthroughs comparable to those that have been made in the fields of weapon yield and propulsion. It is the unfortunate fact that the communications-electronics field has notably lacked such a breakthrough. There is very little in the way of fundamental technique that we are using today that does not antedate World War II. The bulk of our advances has consisted of doing the same old things in a bigger and better way. This "bigger and better" approa will not meet the challenge. It is t slow, and vastly too expensive. Un we achieve a really significant a vance we are faced with the step-b step improvement of our existi systems in the short-term period. the same time we are hoping for t essential long leap over the head our present techniques to attain t major innovations which we mu have if we are to keep up with t weapons systems of which commun cations is an integral part. The pa which without unprecedented i provement, will be the weakest lin

Before concluding my remarks l me say that where we stand toda with respect to military communic tions systems is the product of t persistent, imaginative and sour technical endeavor of a military a industrial partnership. Tomorrow requirements will place even greate demands upon all of us—deman which can be met only by a migh military, scientific and industrial e deavor unparalleled by any effort w have known before. Working t gether as we have done in the pas we cannot fail.

Did you miss the important service AFCEA is offering on page 5? Be sure to turn back and read about the introductory Christmas offer which entitles AFCEA members to send gift memberships to friends for only $4.00.

where there's a will, there's a way

by
Capt. George F. Oliver, Jr., SigC*

After grinding his cigarette into the Korean dust, the Captain looked up and eyed the barren waste of the mountain range. "What a place to build a pole line," he remarked to his 1st Platoon Sgt. "Only mountain goats could walk over that ridge line. How will we get our construction trucks and post hole diggers in to dig and set our 60 and 65 footers?"

He scratched his head, vaulted into his jeep, and headed back to the Company CP.

Company A, 51st Sig Bn, one of the I Corps' supporting Signal Units, had been assigned the building of a power line from Camp "Red Cloud," I Corps Hq, to "Albany," a remote VHF Station located on a high inaccessible mountain ridge overlooking the South Central Korean Area near the town of Uijongbu. In addition, another pole line was to be constructed from "Albany" VHF Terminal, over two mountain ridges to a tactical CP of the I Corps Hqs.

How can it be done? That was the question that plagued the CO of A Company, and it was still bothering him when he ran into his friend Captain "Dutch" Hindbach, Operations Officer of the 13th Helicopter Company.

"Hi, Dutch, how're the whirlybirds?" the Captain asked.

The pilot returned his greeting with a slow Texas drawl, "Howdy partner, what's up?"

Seeing Dutch rang a bell. What was the lift capacity of the H-21 Helicopter? Oh yes, I remember, 6,000 lbs.

"Well, Dutch," he said, "I've got a problem, and I think maybe you and your outfit might be able to give me a hand with it." Turning to the skyline, the Construction Company Commander pointed and said, "See that high ridge directly ahead of us? Well, our outfit has been given the job of building a power line to the top of "Albany" and across those two ridges to the Corps Tactical CP. Now you and I know that the terrain we are looking at is impassable except by foot, and to complete this mission we need our construction equipment to set 60 and 65 foot poles to breach the valley. My men can dig the needed holes by hand, and can string the power cable and spiral four cables after the poles are set, but just how do I get those 2000 to 3000 lb. poles into the correct position and set upright by hand? Well, this is where you might help, Dutch, with your H-21 Helicopter. Here's the way I see it. If we develop some sort of rig which will work with your cargo sling to carry the poles, do you think your H-21 could lift and fly it to a designated spot and put the pole down?"

"Well," Dutch said, "I haven't seen much we haven't been able to do in the way of air lifting equipment. I don't think this particular problem has ever come up before but I sure am willing to give it a try. Tell you what, come over tomorrow afternoon with one of your telephone poles and the rig to work with our cargo sling, and we'll try a few practice runs at our field. O.K.?"

"Say, that's number one, Dutch, I'll be there about 1400," the Captain exclaimed.

Thus began the first use of a helicopter in the construction of a Signal Corps pole line.

The following day the Construction Company Commander, his 1st Platoon Sgt, and several men arrived at the 13th Helicopter Company pad with a 35' creosoted telephone pole and a rig which they had developed. It consisted of 8 ft. of 6m messenger cable and two 3 bolt clamps. The arrangement was to wind the messenger around the top of the pole and anchor it to the pole with two "J" hooks and place a three bolt clamp on the leading edge of the messenger to secure it to the trailing edge. The other end of the messenger was fashioned into a 8" loop held together with another 3 bolt clamp.

The loop was designed to fit into the "quick release" loop of the cargo sling affixed to the bottom of the H-21.

The first experiment was conducted satisfactorily: the H-21 hovered over the pole lying on the ground and the ground crew locked the "quick release" hook to the messenger loop affixed to the pole. The helicopter began its ascent with the pole hanging perpendicular from the cargo sling below the aircraft. When the aircraft picked up speed, the pole trailed it in a manner similar to that of a trailer on a vehicle; it also banked successfully when the helicopter made a turn.

The next problem to solve was the release of the pole at its prearranged location.

By trial and error, a plan was developed using arm and hand signals between the helicopter crew chief and a ground man, to hover the copter over the desired spot, and then be guided downward toward a previously dug hole. The pole was successfully lowered into the hole, and when it bottomed, a signal was relayed through the crew chief to the pilot who actuated the "quick release" and moved the aircraft away. Our pole was in place.

Further planning was necessary to ensure smooth operation. The sequence of events was to survey the line and place stakes where the hole was to be dug. A digging crew followed, dug the required holes, and outlined each hole with white lime so as to be readily seen from the air by the pilot in his approach.

Another construction group selected a level piece of ground where the poles were laid out in sequence for air lifting. A number was chalked on the butt of each pole to correspond with the number assigned a previously dug hole. The operation began with the helicopter picking up Pole No. 1 and air lifting it to hole No. 1, then returning to the original stock pile for the next pole in sequence until all poles were placed in position.

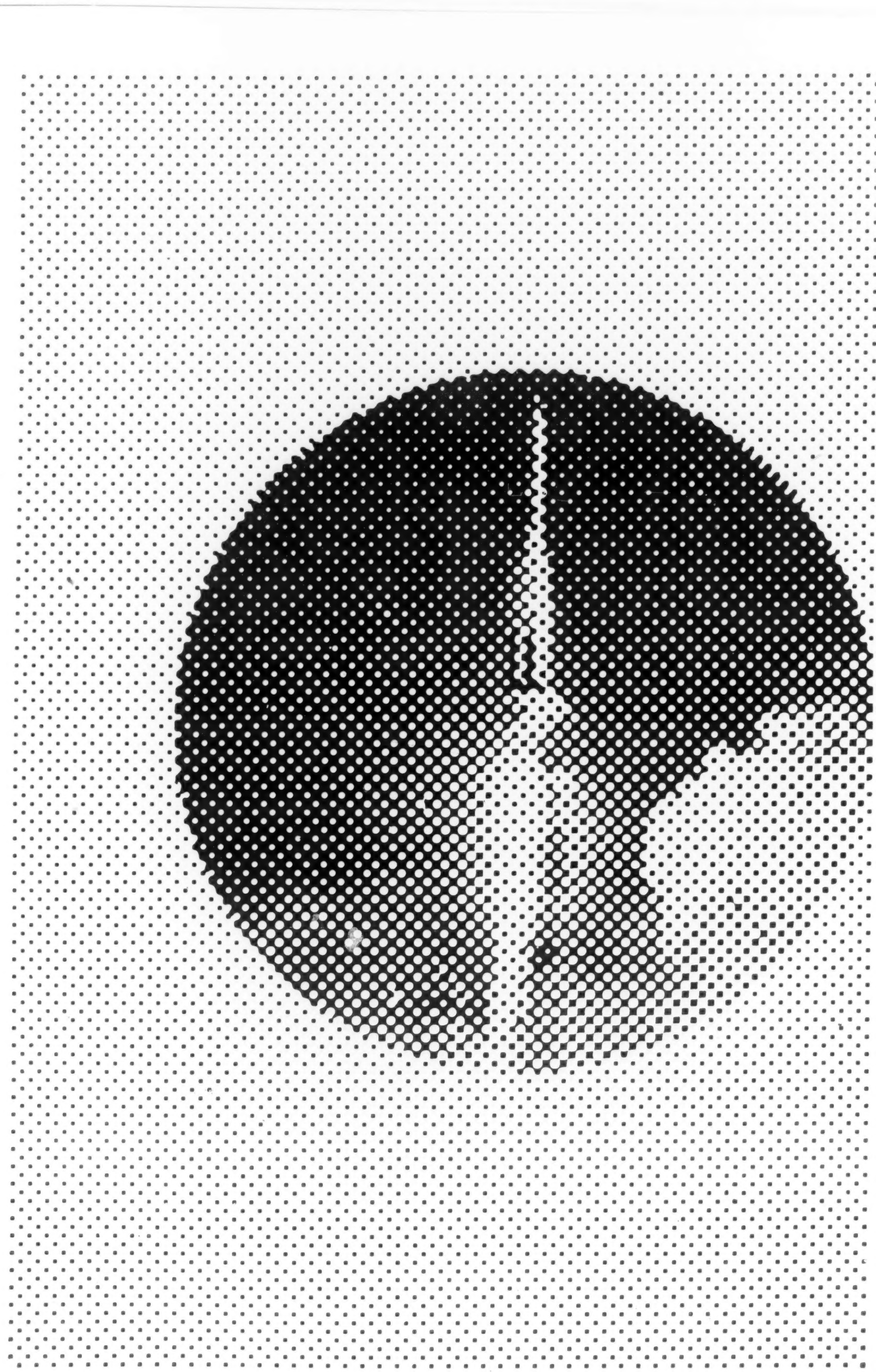
It is necessary for the pilot of the aircraft to be completely briefed on the terrain and of the sequence of events to take place. A dry run is necessary to ensure complete understanding between ground units, crew chief and pilot, of the arm and hand signals used to lower the pole into position.

Once the poles are placed, a construction crew continues with its part of the line construction, filling holes and tamping in the poles, putting necessary hardware on poles, and stringing the wire to complete the construction.

The number of poles set by the 13th Helicopter Co. and Company A on the power line project was forty-eight, and the job was completed in one hour and twenty minutes. The connecting pole line between "Albany" and I Corps Tactical CP was completed in six and one-half hours, setting 97 poles in this operation.

The results of the project proved beyond doubt that an operation of this kind can be very successful; they also demonstrated the value of cooperation between the various branches of the Army. It proved once again the old adage that "Where there's a will, there's a way!"

*The author is assistant PMS&T at Washington and Jefferson College, Washington, Pa.



Communication Requirements

(*Continued from page 16*)

of the extremely crowded spectrum. We expect to employ it in special data transmission systems—for logistics, for instance—and in voice communications. It has a long way to go yet in naval applications, and single sideband is certainly not the ultimate answer to all problems, but it has bailed us out of many difficulties in the last couple of years.

It has enabled the coming to the fleet of the High Capacity Communiaction system which, although still under evaluation, should soon provide fleet units with multiple communication channels. Using a minimum number of transmitters, receivers, terminal equipments and antennas per ship, it should alleviate the crowded space conditions afloat.

To improve our communications, we are continually pressing research laboratories to design new equipment. We want gear which will save us time, space, manpower—and, if possible money. We want it to give us added capacity, security and reliability. We need equipment ranging from very low to extremely high frequencies, and it ranges from equipment for communication circuits with a path length of from one mile to the half-million miles used in moon relay.

Much encouraging research has been accomplished on the very low frequencies. We have already achieved some unusual results—transmitting to a submarine under the Polar Ice Cap was one—but much development is still needed, for the VLF can serve naval forces well. Reliable by day and night, in all seasons, over long distances, and especially over the oceans, it is less subject to interruptions during ionospheric disturbances, and it is unmatched for communicating with totally submerged submarines. Unfortunately, VLF is expensive and its traffic-handling capacity is still fairly low. We need intensified research and development to increase our VLF capability economically. In the meantime, the five Navy VLF stations now in operation will be augmented within the next two years by a two-megawatt station we are constructing in Maine. It will have more than twice the power of any other such U.S. station in existence.

Experimentation gives us much information which will help us to improve our capabilities. Such an experiment is our Communication Moon Relay (CMR).

The moon has come into prominence recently as a missile terminus. But it can also be used as a communication relay. In 1946 the Army

discovered that radar echoes could be received from the moon, in 1951 the Navy bounced CW off the moon, and in 1954, the Naval Research Laboratory passed the first transmission of voice messages over the earth-moon-earth path. In 1956, we moon-relayed single channel, one-way RATT messages from Washington to the West Coast, and a year later to Hawaii.

The initial tests were handled with makeshift non-steerable, non-directional antennas and low powered transmitters. But the resultant short-lived communications, like the Wright Brothers' Kittyhawk airplane, were enough to prove that, with higher power and better antenna positioning the system would work. Acting on this basis, the Chief of Naval Operations ordered a moon relay circuit between Washington and Hawaii for complete evaluation of moon relay communications under operational conditions. A research contract was awarded in May 1956, and now a pilot circuit exists, linking Washington and Hawaii. Still being evaluated, its capabilities include multi-channel teletypewriter, voice and facsimile.

Of course, operation of the CMR system is limited—the moon must be visible from both terminals at the time the message is sent. This may mean the system can be utilized only a few hours a day, or perhaps as long as 12 hours, depending on the position of the moon. Operating schedules are established by the time of moonrise at the Westward terminal and moonset at the Eastward terminal. During these periods, and when the circuit is not being used for research, we will pass our every-day message traffic to and from Hawaii. Eventually we hope to be able to send and receive messages from ships at sea via the moon.

What are our future requirements? We in the Navy are convinced that the greatest age of sea power lies just ahead, as new technological progress brings to full fruition man's age-old struggle to conquer and exploit the vast ocean spaces of the earth. As long-range ballistic missiles make fixed land installations more vulnerable and unreliable, more of our total offensive power must be moved to sea.

We visualize, as our ultimate naval communications requirement, a system which will satisfy all of the operating requirements of the Navy of the 1975 era. The present posture of Naval Communications is one of evolutionary conversion to that future system. It will be a system completely automatic, capable of handling all forms of thought and information reliably, securely, and rapidly. T various modes of communicati will be handled in one secure bin digital flow of signals, being au matically switched as required. T system is expected to have a hi degree of immunity to jamming a other interference and disturban and will be world-wide in scope.

Naval Communications will mo more and more to sea. Seaborne s tions will be free of the cares wh attend bases on foreign soil. Inste they will enjoy the seagoing attribu of mobility, concealment and flexi ity, and will be able to respond qui ly to varied assignments and roles.

We believe that mobile naval co munications stations afloat will gre ly enhance the Navy's overall pot tial. We believe they are an absol requirement for the 1975 Navy.

The command and control of t global forces of the nuclear, space a Navy makes increasingly urgent d mands on Naval Communicatio Satisfaction of these demands kee us pressing against the frontiers science and the state of the art communications-electronics.

Our communications requiremen derive from and are actually part the operating requirements of o forces serving throughout the wor In this day and time communicatio must be intergrated into weapons sy tems, and into all other parts of t mechanism by which forces are ope ated, just as the voice is integral the man. Naval tasks may be assign to large forces or to the smallest si gle ship half way around the wor Means must be available to obta instant response from either in a cordance with the situation existi at any time and place. The Na therefore is interested in all ne ideas and their application to t Naval Communications problem.

With the expansion of our enti communication horizon into space few of our more complex proble will be more amenable to solutio We look to space to provide a ne and more practical method of solvi some of our older problems.

In summation, we might say th to an old communications requir ment for speed, reliability, and sec rity has been added a requireme for complete flexibility and versatilit Naval Communications, as the on capability to satisfy the fleet's eno mously demanding requirement must be flexible—in method, ci cuitry, programming—flexible meeting new challenges with ne ideas, wherever they may originat to provide the unique communic tions for the fleets of tomorrow.

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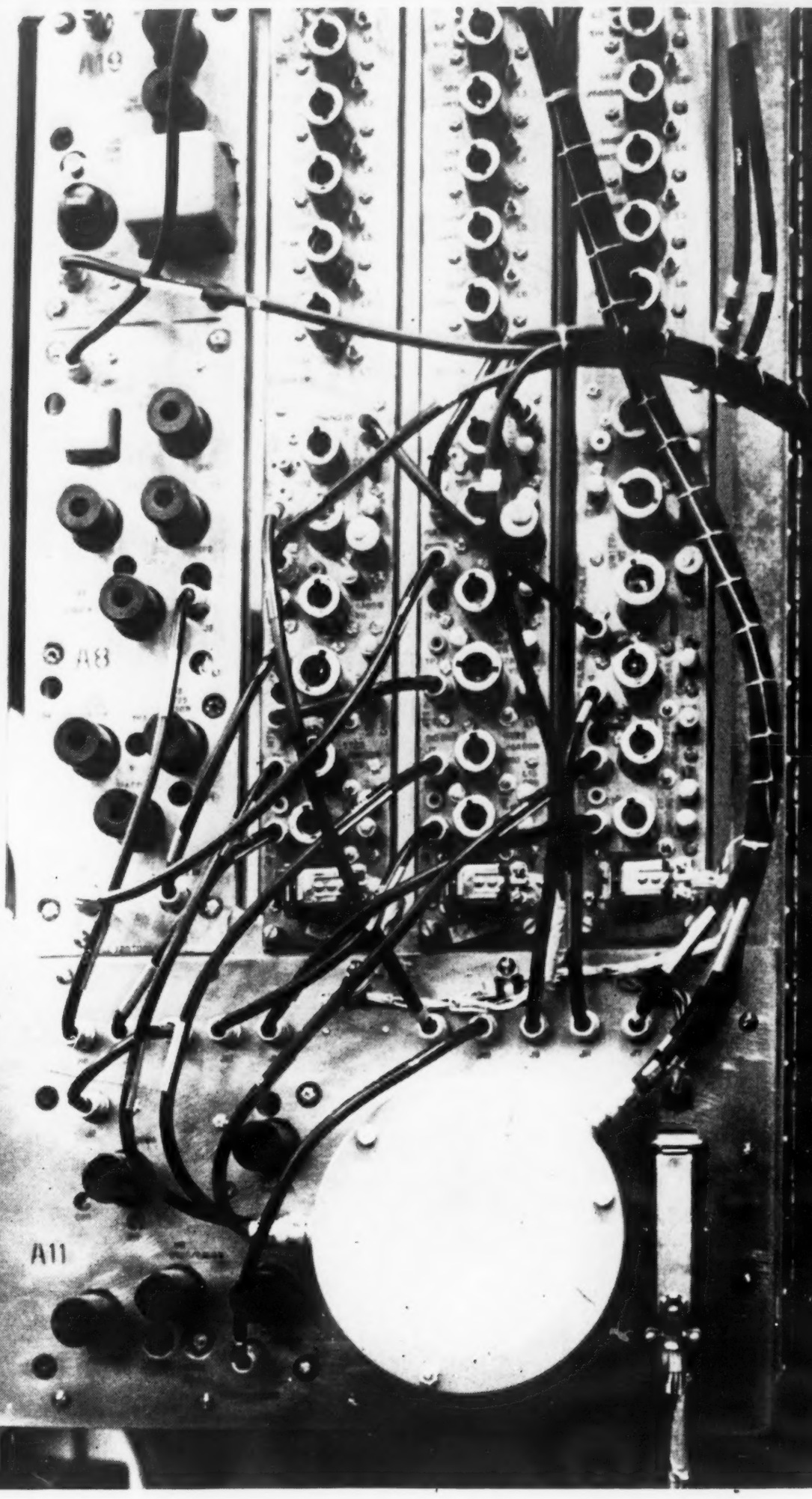
AN ACHIEVEMENT
IN DEFENSE ELECTRONICS



NEW SONAR SIGNAL PROCESSOR DOES WORK OF 1,000 UNITS

The first sonar signal processors to utilize time compression are being produced by General Electric. These new processors were developed in cooperation with the United States Navy. Extracting only critical bits of transmitted and received signals in series, one unit can perform as many correlating operations on a continuous signal—in the same time—as a parallel processor with thousands of units.

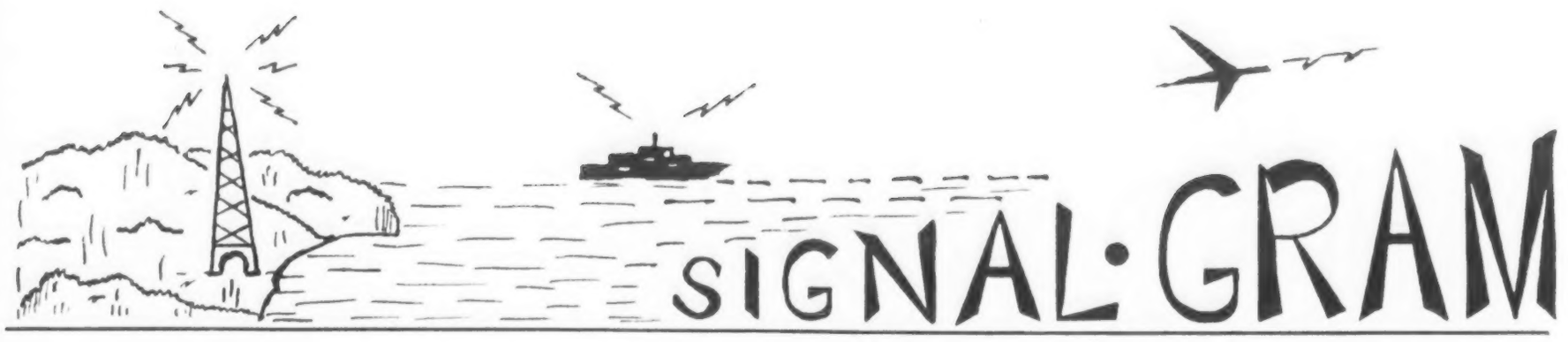
Excellent improvement in signal-to-noise ratio also makes these new processors effective against background levels which have formerly made certain signals undetectable by any other practical means. The new equipment is also designed to handle signals from more than one transducer.

This advance in sonar signal processing is typical of General Electric's many achievements in defense electronics. 227-3

Progress Is Our Most Important Product

GENERAL ELECTRIC

DEFENSE ELECTRONICS DIVISION • HEAVY MILITARY ELECTRONICS DEPT. • SYRACUSE, N. Y.



—GOVERNMENT—

AOMC NEW CHIEF will be Maj. Gen. August Schomburg, present Deputy Chief of Ordnance. General Schomburg will succeed Maj. Gen. John B. Medaris, who is retiring, as Commander of the Army Ordnance Missile Command, Huntsville, Ala., Jan. 31. Until then, General Schomburg will devote a major portion of his attention to the AOMC headquarters. The selection of the new chief was based on "his thorough familiarity with and extensive background in all phases of Ordnance operations, particularly in the areas of research and development experience in missile and space activities," according to a Pentagon release.

ATOMIC ENERGY COMMISSION will issue permits for the construction of atomic reactors at the University of Missouri and Stanford University. The AEC is donating $150,000 for each ten-kilowatt reactor. They will be used primarily for student training.

AIR FORCE DISCOVERER VII failed to eject its heavily instrumented capsule in the sixth unsuccessful attempt to recover a capsule. Launched Nov. 7 at Vandenberg AFB, Calif., Discoverer VII achieved orbit, but power failure occurred in the electrical supply system that was to eject the 300-pound capsule. Six of the seven Discoverers have been equipped with capsules designed to parachute back toward earth. Two of the satellites failed to go into orbit and one ejected its capsule in the wrong place—over the Arctic. Capsules in the other two satellites failed to send out radio signals, so were never recovered.

ANOTHER LITTLE JOE ROCKET launched a man-in-space type capsule, Nov. 4. The purpose of the successful experiment was to test the capsule's escape system which is designed to lift the astronaut and his capsule away to safety if the launching rocket fails. Fired to an altitude of seven miles from the National Aeronautics and Space Administration's test station at Wallops Island, Va., the capsule was recovered after floating back by parachute to a landing in the Atlantic.

NASA PLASTIC SPACE BALLOON was inflated 250 miles above the Atlantic Ocean, near Wallops Island, Va., after being jammed into a container 26½ inches in diameter at the time of its launching, Oct. 28. Weighing 130 pounds, the aluminum-coated sphere remained aloft for about half an hour. It was the first in a series launched by the National Aeronautics and Space Administration to determine whether balloons can serve as reflectors of radio and radar beams in space. An attempt may be made to place one of these spheres in orbit soon.

ALASKAN NUCLEAR BLASTS, financed largely by the Atomic Energy Commission, will be set off in 1961 to create an artificial harbor on the Northwest coast of Alaska. According to Dr. Edward Teller, "The main purpose of the blasts is not the construction of the harbor. It is a demonstration that we can do what we say and that we can do it safely." The plan calls for three nuclear blasts of 20 kilotons which will carve out a 300-yard-wide channel near Point Hope and two blasts of 200 kilotons to complete a turn-around basin about 600 yards wide and twice as long.

EXPLORER VII'S TRANSMITTER will be turned off within a year by an automatic electronic timer designed by Bulova Watch Co., Inc. under contract to the Army Ballistic Missile Agency. The tiny self-powered timekeeper will shut off the solar-powered batteries of the Explorer's transmitter to prevent the satellite from broadcasting after its usefulness is over and to assure that the atmosphere does not become saturated with satellite signals. Explorer VII was launched Oct. 13.

AIR FORCE BASE AND FIVE UNITS will be inactivated soon as a result of "the changing composition of the Air Force, involving increasing numbers of missile units and decreasing numbers of aircraft units." Ethan Allen Air Force Base, Vermont, will close next March and the 37th Fighter-Interceptor Squadron operating from Burlington Municipal Airport will be inactivated at the same time. At Youngstown Municipal Airport, Ohio, the 86th Fighter-Interceptor Squadron and the 79th Fighter Group Headquarters will be inactivated this month. The 15th Fighter-Interceptor Group Headquarters and the 47th Fighter-Interceptor Squadron at Niagara Falls Municipal Airport, New York, will be inactivated next summer. (*Continued on page 44*)

Most commended features of ALFAX Maps

Crisp brown markings on clean white paper

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Clear crisp duplicates by Bruning or Ozalid

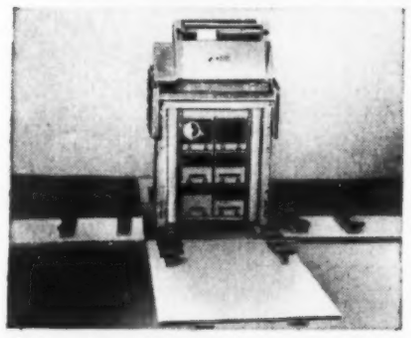
- PLUS THESE UNIQUE FEATURES . . .

LOW COST—Alfax paper cost savings on full schedule operation save 1/3 to 2/3 in yearly operation costs.
CLEAN—electricity is the ink for Alfax paper, ion deposits make crisp brown marks without dust, smudge or chemical irritants.
STABLE Alfax stores indefinitely . . . contains no voids or splices . . . recording marks are permanent.

Here's why . . . FORECASTERS PREFER EQUIPMENT AND ALFA

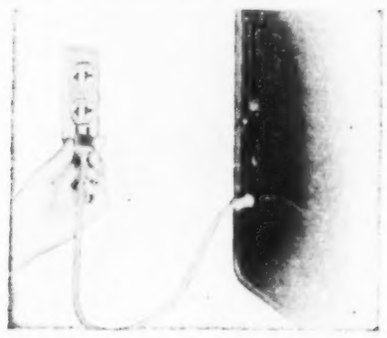
Most commended features of ALDEN RECORDERS

- ***EASE OF INSTALLATION*** . . . compact and mobile

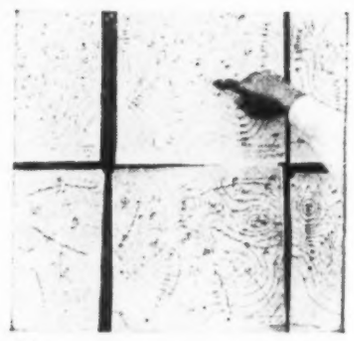


Uncrate

Roll in



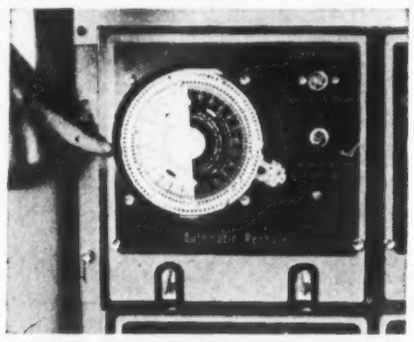
Plug in



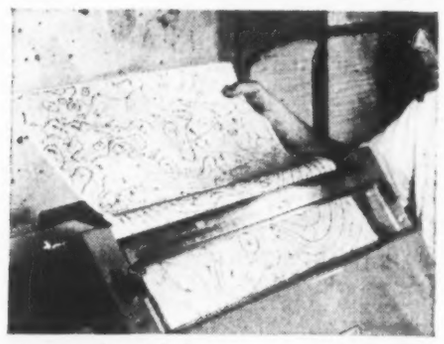
Clean crisp maps immediately

- ***EASE OF OPERATION*** . . . new high in clean, quiet operation

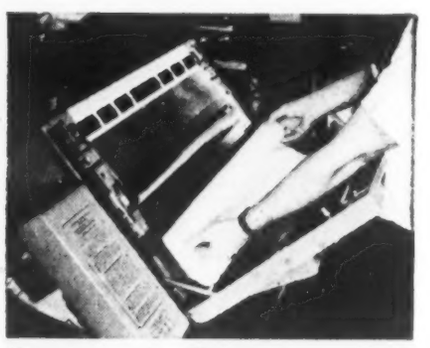
Automatic and continuous



Time clock programming

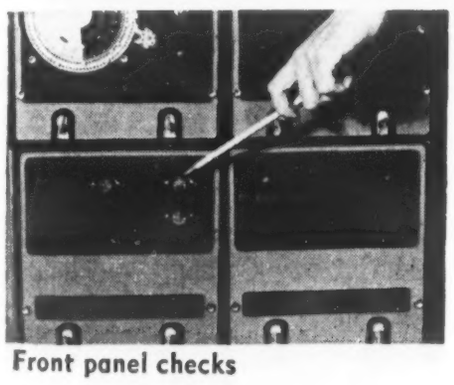


Instantly visible

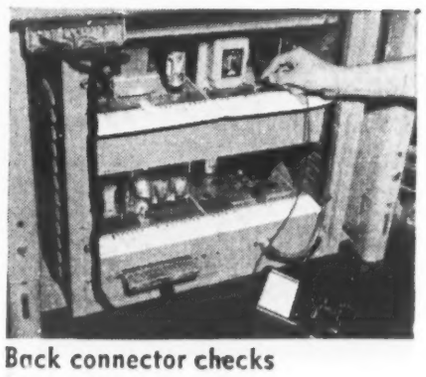


Easy paper loading

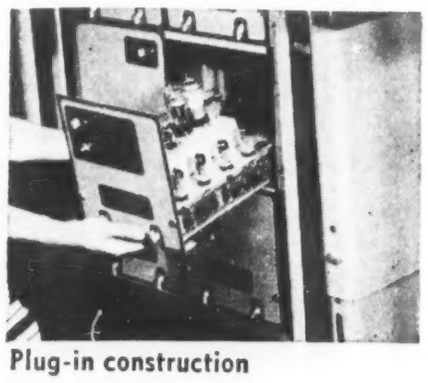
- ***EASE OF MAINTENANCE*** . . .



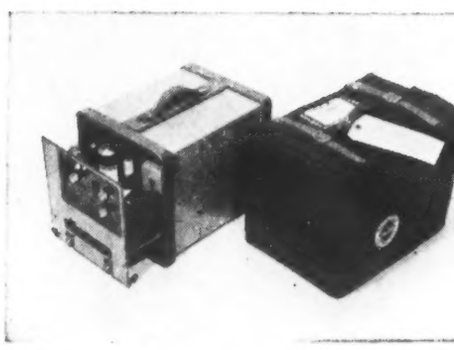
Front panel checks



Back connector checks



Plug-in construction



Air Freight replacement

- PLUS THESE UNIQUE FEATURES . . .

SECURITY—low voltage marking process does not generate a signal that can be intercepted.
HIGH SPEEDS—60-90 or 120 rpm operation . . . recorder technique and paper capable of fifteen times these existing speeds.
PRODUCTION—designed for volume production on short lead time . . . using unique expandable manufacturing techniques.

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LFAX

ALDEN FACSIMILE MAPS...

. . . and why we think you'll like them too.

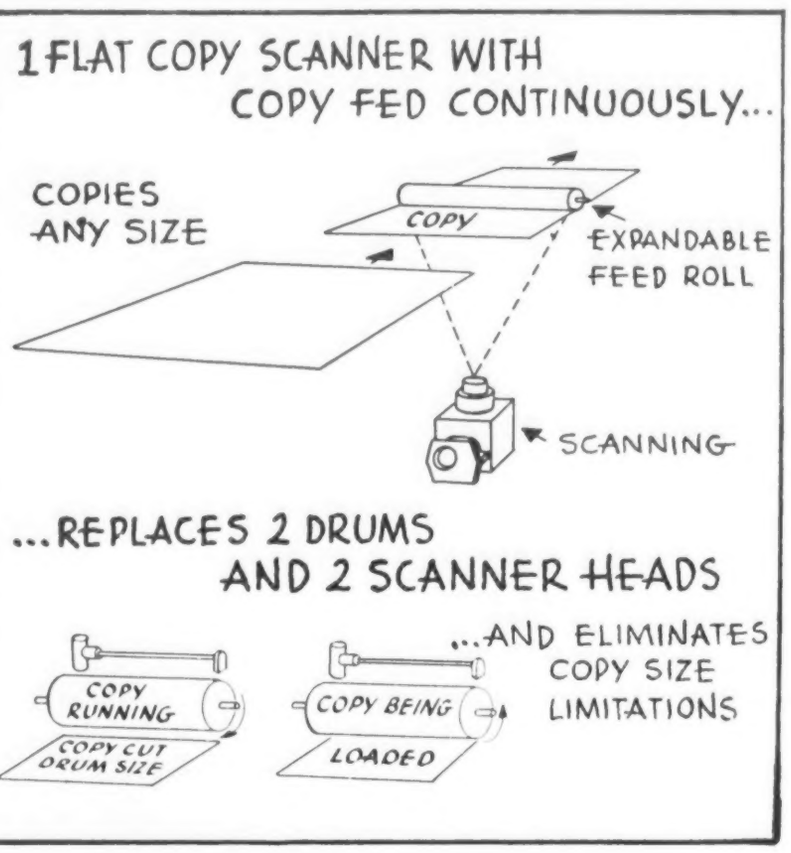
Since 1954 Alden Facsimile Weather Map Recorders and Alfax maps have been replacing existing facsimile equipment on the National facsimile Weather Map Network at an accelerating rate.

U. S. Weather Bureau stations converting to Alden equipment will be complete by the end of the fiscal year with many independent forecasters, air lines and institutions following suit.

The new U. S. Weather Bureau's high altitude weather network, local and overseas networks are being expanded with Alden Facsimile Recorders and continuous flat copy scanners.

*Fifteen out of twenty forecasters after having operating experience with all weather facsimile systems indicated a *marked preference for* Alden Recorders and Alfax Maps.

ALDEN ELECTRONIC AND IMPULSE RECORDING EQUIPMENT CO., INC.
Westboro, Mass.



NEW BOON TO CONTINUOUS FACSIMILE NETWORK OPERATION REALIZED WITH ALDEN FLAT COPY SCANNING SYSTEM

Compact, mobile flat copy scanners provided by Alden Electronics Company, Westboro, Mass. moved onto the new U.S. Weather Bureau Hi-altitude Weather Facsimile Network Feb. 16, 1959 to begin a new era in simplified facsimile communications systems

• INSTALLATION SIMPLIFIED . . .

Uncrated from fold-a-way shipping boxes at Suitland, Maryland, and Idlewild, N.Y. — Alden scanners rolled in, plugged in and turned on to begin new era in weather facsimilie networks. Tested in 2 hours for 60, 90, 120 rpm, the equipment was turned over to the U.S. Weather Bureau personnel the same day. Addition of transmission and receiving points has been expanded with *higher speed operation* of 120 rpm started June 20th on completion of line balancing by American Telephone and Telegraph Co. which doubled the speed, transmitting copy of the same detail (size of characters and information *not* enlarged) as at 60 rpm.

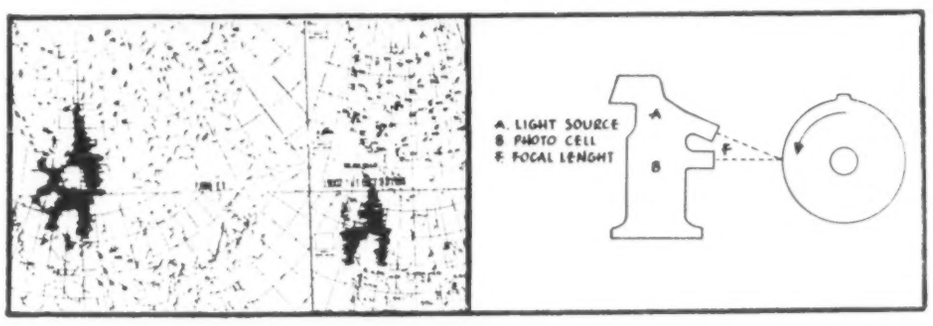
• EASE OF COPY HANDLING . . .

With map sizes no longer restricted to drum mounting, continuous transmissions of maps (one after the other) with one scanner halves the space and maintenance problems, makes possible *scanning the original* plotted maps without cutting to size; map plotters and forecasters have *originals back in ½ the time.*

Flat Copy Scanner with expandable copy feed head takes maps any width or length — fed straight or kitty corner.

With copy feed rolls precisely positioning surface of map on flat copy scanner table, exact focal lengths are maintained for clear, sharp recordings.

• FOCUS SMUDGE ELIMINATED



Focus smudge caused by unusually thick copy or copy lifting from drum.

• MOST COMMENDED FEATURES

Personnel familiar with prior facsimile scanning techniques, lauding this new breakthrough in weather facsimile techniques, highly commend these features:

- ease of copy handling
- compactness and mobility of equipment
- quietness and dependability of operation
- cleanness and sharpness of copy produced

Hi-Altitude Facsimile Weather Drops

are available from American Telephone and Telegraph Co. for qualified companies and organizations.

For those interested in facsimile communication systems, Alden Electronics makes flat copy scanner heads and recorders in all sizes and speeds (up to 30 times present network speeds) furnishing components to qualified manufacturers, and complete facsimile systems to end customers.

We invite your inquiry.

Project Mercury—Man's Venture into Space

(*Continued from page* 10)

With this background of the objectives, principles, and approaches selected for Project Mercury, let us see where the first man will fly if our method of approach is successful.

Figure 1 shows that the Mercury vehicle will be launched from the Atlantic Missile Range, Cape Canaveral, Florida, in a direction just slightly north of east so that it will pass over Bermuda during the orbital injection process. Actually the vehicle will fly in a closed circular path around the earth but when such a path is projected on a flat map representation of the earth's surface, we end up with the apparent undulating or sinusoidal path shown here.

Recovering the Astronaut

According to present plans, the vehicle will, as I said, circle the earth three times, taking about 1½ hours an orbit for a total flight time of about 4½ hours. On the third pass, as the vehicle approaches the western coast of North America, the retro-rockets will be fired, reducing the flight velocity about 500 feet a second. This decrease in velocity will cause the vehicle to enter the atmosphere on a ballistic flight path and it will eventually land in a recovery region in the western Atlantic Ocean. A recovery team of U. S. Navy and Air Force units will locate and retrieve the vehicle and the Astronaut.

The vehicle that will actually make this momentous journey around the world in 1½ hours is shown in Figure 2. We refer to it as a capsule because it is essentially just that — an airtight, watertight, conical chamber in which the man and all of the equipment necessary for the flight are housed. The capsule is oriented in the position it will have on take-off, when it will lift vertically toward the top of the slide. It is also the relative position it will have on re-entry where it will move in a direction from the top to the bottom.

The pilot will lie in a form-fitting, foam rubber couch. During the course of his flight, he will be able to control the roll and pitch of the capsule by using small jets. The retro-rockets are shown as they will be attached at the bottom of the heat shield, which will dissipate the heat generated on the front of the capsule during the re-entry from space. The cylinder at the top of the capsule contains parachutes used in the final descent.

Figure 3 shows the lash-up of the capsule on the Atlas booster as it might appear during the early stages of the launch. In this photo the escape system is shown mounted on the upper end of the capsule.

The Escape Rocket

In the unhappy event that the escape system might have to be utilized, a sequence of actions would be expected to occur. After an indication of impending disaster, rockets mounted on the tripod arrangement on top of the capsule would be armed and fired as the clamp holding the capsule to the Atlas booster is released. I might say that an analysis of booster malfunctions of the sort that would cause us to use the escape system has indicated that, with proper instrumentation, enough time should be available to activate this escape system.

The escape rocket has sufficient thrust to pull the capsule away from the booster rocket rapidly and far enough to escape any effects of a booster explosion. If there should be a malfunction on the launching pad for example, the escape system would whip the capsule over 2,000 feet in the air within seconds. At the peak of its escape trajectory the escape rocket and tripod would be separated from the capsule. The capsule would then be turned to the proper re-entry position, the parachute would be deployed and the capsule would be landed at a low enough velocity to avoid injury to the Astronaut.

The sequence of events that will occur during a normal orbital flight are shown in Figure 4. After a conventional Atlas launch from Cape Canaveral, the booster will go through its normal firing sequence. The booster engines will drop off at a relatively low altitude and the sustainer engine will continue to fire as the vehicle lays over until orbiting speed is obtained, at an altitude of about 110 miles. During the booster flight the escape system will be jettisoned after the booster engines drop off in the staging point. When orbiting speed is obtained the capsule will be separated from the booster and will proceed on its own. It will be immediately turned around to its design flight condition with the blunt end forward and will race around the world the chosen number of times.

The retro-rockets will be fired at the proper time and the capsule will gradually re-enter the atmosphere. A sea anchor parachute will be opened at about 70,000 feet to stabilize the capsule during its transonic flight speeds in the upper atmosphere: the main parachute will be opened at about 10,000-to-12,000 feet altitude for the normal landing sequence. Incidentally, the capsule will have a second emergency parachute in the event of malfunction of the main chute.

Little Joe, Redstone and Atlas

I would like now to present some idea of the amount of work that must be accomplished successfully before this first manned orbital flight. In Figure 5 we see several booster vehicles considered in our early planning for flight testing the Mercury system prior to the final flight. Our studies lead us to eliminate the Jupiter vehicle, so our rocket flight test program is actually being carried out with the other three types of vehicles.

On the left is a special rocket booster composed of a cluster of eight solid propellant rockets developed for the Mercury flight test program. The Project people call it Little Joe because of its small stature compared with other rockets in the program. Little Joe will be used to launch capsule test vehicles to a maximum distance of a little more than 100 miles for evaluation of the structural and aerodynamic correctness of the capsule design. Little Joe also is being used to test the escape system at high velocity.

The Redstone booster will be used for further tests of the capsule and its instrumentation and will also serve a very important role as a trainer for the Astronauts prior to full orbital flight. An Astronaut can ride in the capsule mounted on the Redstone for a maximum distance of about 120-130 miles. During this flight he can experience all of the sensations that will later be encountered during the launch and re-entry of the capsule, with none of the hazards of a complete orbiting flight.

The Atlas booster will be used not only for the final launching of man into orbit but for earlier suborbital tests of the final capsule configuration on flights up to 1,700-to-1,800 miles. When used as a test vehicle, the Atlas can be programmed to subject the capsule to all the launch and re-entry conditions that will be experienced in the final orbital flight.

Dedicated, sober, intelligent and highly charged with both the spirit of adventure and the spirit of scientific inquiry, the seven Mercury Astronauts will carry out this nation's most exciting venture into the unknown in which man himself may participate.

RECOVERY AREA
TRACKING AND COMMUNICATIONS
COMMUNICATIONS
EXISTING FACILITIES

Figure 1
Orbital Flight
Paths

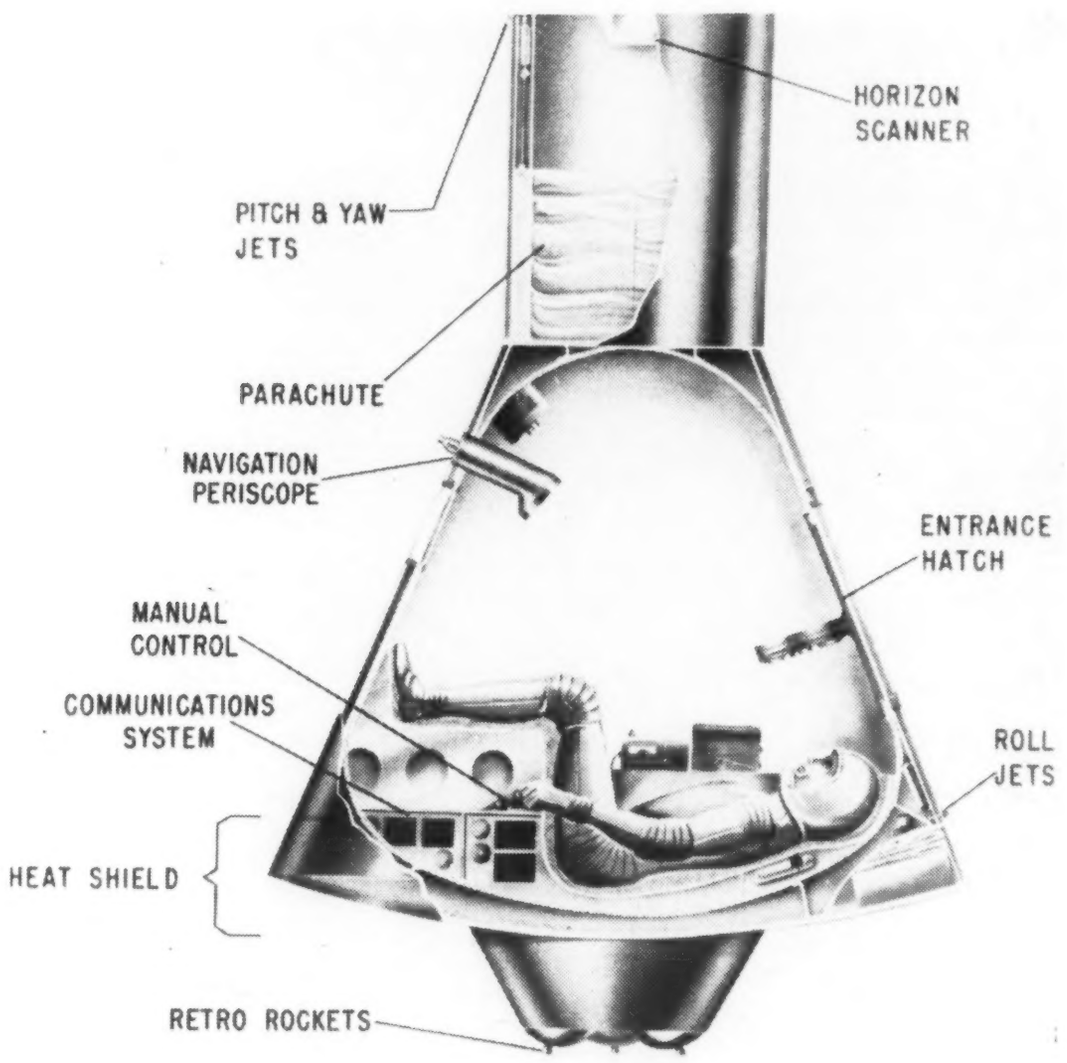


Figure 2
Ballistic
Capsule

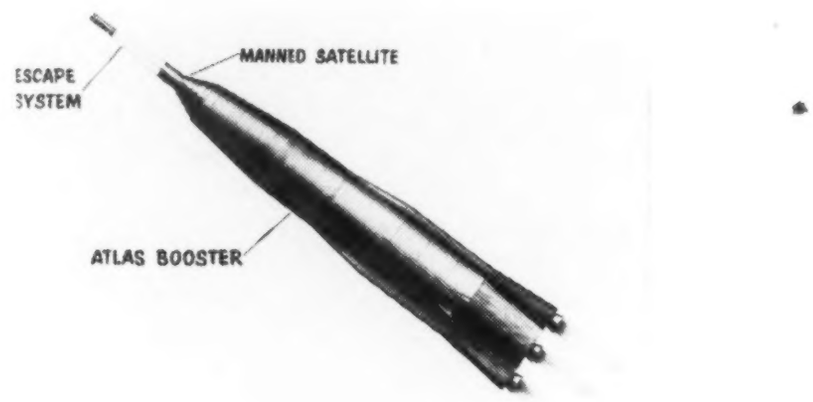


Figure 3
Ballistic
Capsule
and Booster

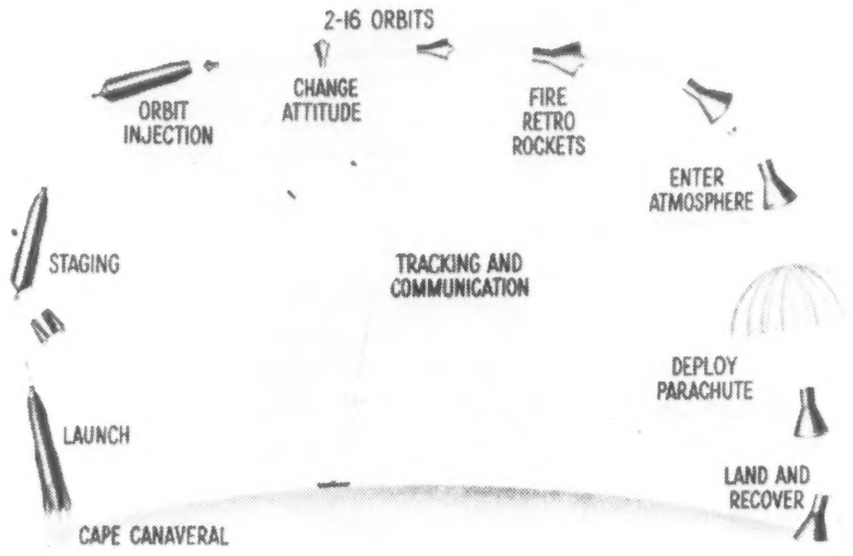
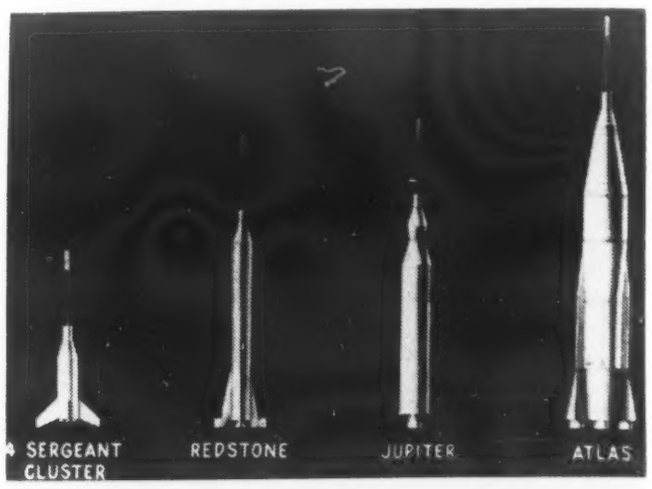


Figure 4
Flight
Trajectory

Figure 5
Rocket Flight
Test Vehicles



Signalgram (*Continued from page 39*)

FIVE ARMY SCIENTISTS discovered a way to pack five times more electronic gear into missile nose cones. The Army science team from Diamond Ordnance Fuze Laboratory, Washington, D. C., made the discovery by combining new techniques in photography and lithography with existing printed circuit techniques. Considered a major scientific breakthrough, the discovery should lead to reductions in size, weight and power consumption of future Army equipment.

—INDUSTRY—

MARTIN CO. will stop building aircraft in mid-1960 and expand its work in electronics. During World War II and since then, the company has built flying boats, light bombers, patrol craft and twin-engine aircraft. Martin is now a leading missile builder with such projects as the TITAN intercontinental ballistic missile and a number of shorter-range missiles. The company also has plans to enter the nuclear energy field.

GENERAL ELECTRIC CO. will construct a $14 million center for space technology research and development near Philadelphia, Pa. The new center, which will be part of GE's Missile and Space Vehicle Dept., will be "one of the nation's largest privately financed space research facilities," according to GE. Plans call for the center to be built in two phases. Initial construction, scheduled for completion in 1961, will include a department headquarters building, an aerosciences laboratory and an engineering and development facility. The second phase of construction is planned for 1962-1963, and will include facilities for development manufacturing, product design, quality control and acceptance testing.

UNITED AIRCRAFT CORP., PRATT & WHITNEY AIRCRAFT DIV. has developed a machine said to make possible construction of one-piece, weld-free rocket and missile cases of record size and high strength. The machine uses the technique of flow-turning, the stretching and shaping of disks and rings of metal by causing the metal to flow over a spindle under great pressure on high-speed rollers.

WESTERN UNION TELEGRAPH CO. is making available this month intercity Public Facsimile Service to the general public. The service, to be initially offered between Washington, D. C., New York City, Chicago, Los Angeles and San Francisco, will provide for the transmission of full page correspondence, letter-size documents, drawings and other recorded data coast to coast. The material to be transmitted need merely be typed, written or drawn on a sheet of white letter-size paper. It will be placed on the Western Union facsimile drum which, at the push of a button, will begin revolving at 180 revolutions per minute. As the drum revolves, an "electric eye" will scan the material.

MARCONI'S WIRELESS TELEGRAPH CO. LTD. has developed a new short-wave radio transmitter that can simultaneously broadcast two or more indererdent transmissions on different wave lengths. The secret of the new transmitter is a device known as a distributed amplifier. Unlike conventional types, this amplifier dispenses with tuning controls. The design is such that even if a tube fails, the transmitter will continue with only a slight reduction in output.

RCA SERVICE CO. has announced the realignment of its operations into two major departments, Commercial Services and Government Services. Previously there were three departments. Under the new organization, Consumer Products and Technical Products have been consolidated into Commercial Services.

REMINGTON RAND UNIVAC DIV., SPERRY RAND CORP. has developed a new electronic computer system, Univac Larc Solid-State Computer, which can operate at speeds up to 200 times faster than any computer in existence today, according to the company. Originally designed and constructed by Remington Rand for the Atomic Energy Commission, the Larc will enable business management to process problems quickly through the use of new logic designs, new ways of routing information through the computer system and new ways of manipulating data.

CONTRACTS: ARMY: Samuel N. Zarpas, Inc., and Fullerton Construction Co., construction of BOMARC facilities at Travis AFB, $2,430,000; Radioplane, Div. of Northrop Corp., production of 255 SD-1 drones, $2,300,054; Ralph M. Parsons Co., construction of TITAN test launch facilities at Vandenberg AFB, $2,200,000; NAVY: Carrier Corp., production of steam-activator absorption cooling equipment for nuclear submarines, $3,000,000; Telephonics Corp., production of head chest sets, type SA(7)C, $1,006,250. AIR FORCE: Boeing Airplane Co., construction of the DYNA-SOAR manned space glider, and The Martin Co., production of rocket boosters to power the vehicle; no estimate of the eventual cost of DYNA-SOAR, but $53,000,000 available for project in current fiscal year; Collins Radio Co., for providing a microwave communication system, $2,000,068.

(*Continued on page 48*)

MOTOROLA MILITARY CAPABILITIES REPORT:

SEASONED IN THE SERVICE

William Wheeler, vice president in charge of Motorola's Military Electronics Division discusses participation role in the B-70 project being developed for the Strategic Air Command at North American.

"North American's pre-award analysis and evaluation, before awarding the contract for the Mission and Traffic Control System of the B-70 Valkyrie to Motorola, was one of the most thorough and extensive ever made."— North American Aviation, Inc.

On the next two pages: Motorola's Seasoned Military Service Record.

Since before World War II, Motorola has demonstrated its exceptional ability in military electronics on assignments that include communications equipment . . . radar . . . missile guidance . . . data processing and display . . . antisubmarine warfare . . . demonstrating with each success the value of a technical task force that is . . .

Roy Olson, general manager of Motorola's Chicago Military Electronics Center, which emphasizes work in surface and subsurface electronic equipments and systems.

Seasoned in the service

Hundreds of thousands of Motorola walkie-talkies were produced for World War II combat use.

Few weapon systems now under development are expected to play as important a role in U.S. defense in the coming decade as the B-70 Valkyrie. This fantastic new weapon will cruise at more than 2000 m.p.h. at altitudes over 70,000 feet.

Motorola's long record of military electronic achievements led to its appointment as major systems manager to develop and build the B-70's vital Mission and Traffic Control System.

This major system encompasses the communications, navigation, identification (IFF), and landing aids. It will keep B-70 crews in constant contact with each other and with U.S. headquarters from anywhere on the globe. It will provide the Valkyrie with its capability to be electronically directed to a designated target anywhere in the world and be immediately recalled on command.

High-level responsibilities such as this are not new to Motorola. It was in June of 1940 that the prototypes of the history-making Motorola walkie-talkie were delivered to the U.S. Army Signal Corps. During World War II, Motorola not only supplied vast quantities of equipment that kept advancing U.S. ground troops in constant communications, but was also chosen by the Signal Corps to direct and manage the supply of the entire U.S. Army's need for electronic crystals. These critical frequency-determining components were vital to radio communications.

In the late forties and early fifties it was weapon fuses, radar bombsights and tactical microwave communications. Today, in company-owned research and production centers across the country, thousands of Motorola engineers and scientists are at work on a broad range of military projects. Included are missile guidance, high-resolution radar, sonobuoys, the next generation of equipment for radio-telephone communications between ground troops, and advancement of the frontier of knowledge in solid-state electronics.

Motorola's exclusive concentration in electronics, its cost-conscious approach to producibility, and its preoccupation with reliability are evident in every military product from the smallest solid-state device to the most complex weapon systems. Small wonder that with the military, Motorola rates one of the highest confidence quotients among suppliers of electronics equipment. For in the development and production of military electronics, it has been proved time after time, *there is no substitute for seasoned experience.*

For a comprehensive brochure on Motorola's Military Electronics capabilities, write Technical Data Service, Motorola, Inc., Military Electronics Division, 8201 East McDowell Road, Scottsdale, Arizona.

MOTOROLA

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Joe Chambers, Motorola vice president and general manager of the Western Military Electronics Center, directs Phoenix laboratories concerned primarily with work on sophisticated airborne and spaceborne electronics.

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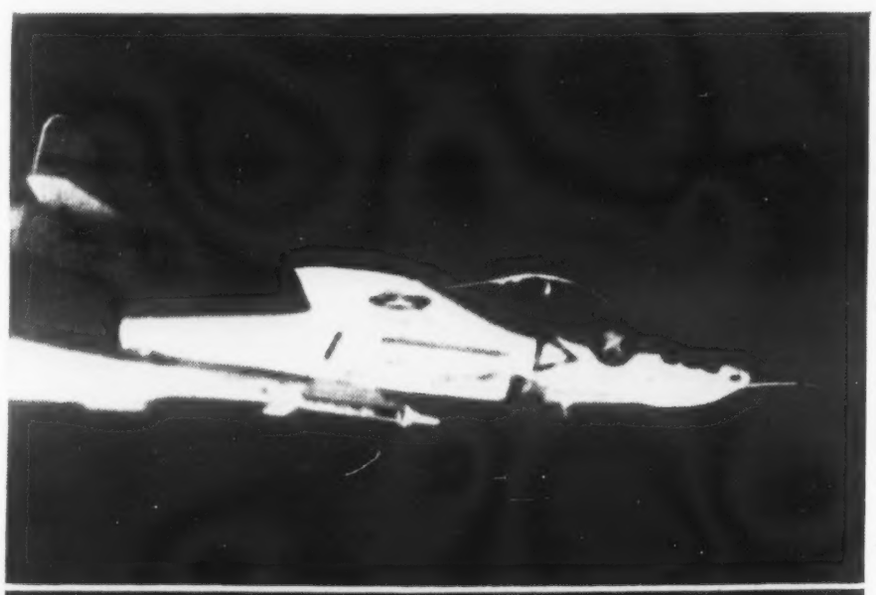
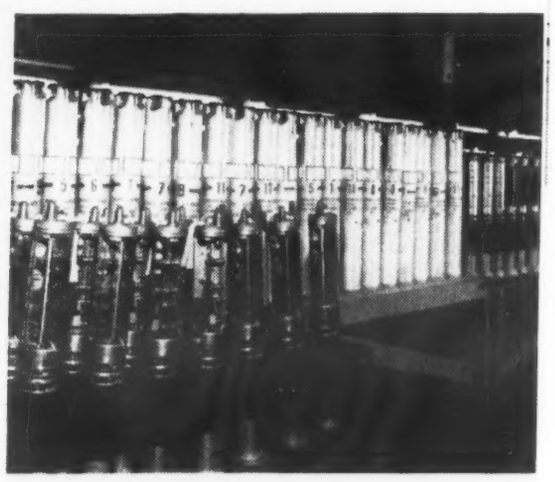
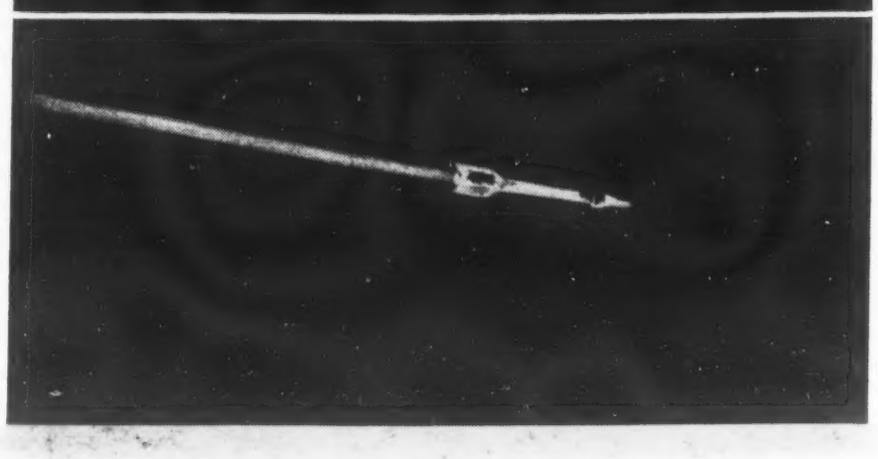


Inspection, the eyes of quality control, helps convert experience into reliability at Motorola.

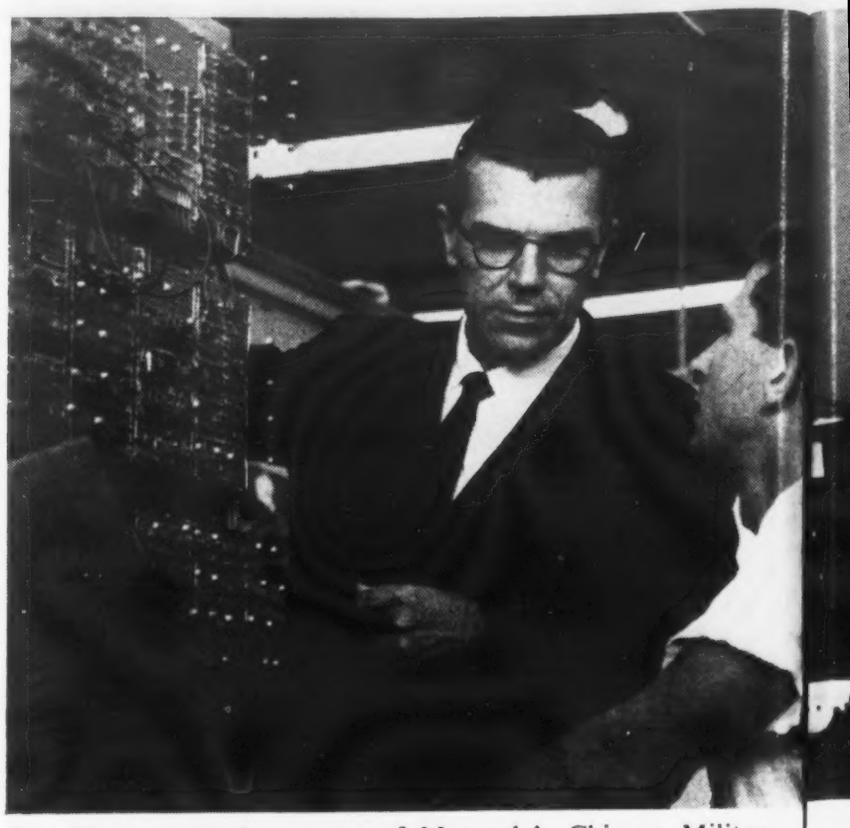


AN/SSQ-23 Sonobuoys for the anti-submarine warfare program in volume production at Motorola Chicago.



Motorola is making significant design contributions to advanced guidance head for Sidewinder air-to-air missile which is under fabrication at Phoenix laboratories.

Since before World War II, Motorola has demonstrated its exceptional ability in military electronics on assignments that include communications equipment . . . radar . . . missile guidance . . . data processing and display . . . antisubmarine warfare . . . demonstrating with each success the value of a technical task force that is . . .



Roy Olson, general manager of Motorola's Chicago Military Electronics Center, which emphasizes work in surface and subsurface electronic equipments and systems.

Seasoned in the service

Hundreds of thousands of Motorola walkie-talkies were produced for World War II combat use.

Few weapon systems now under development are expected to play as important a role in U.S. defense in the coming decade as the B-70 Valkyrie. This fantastic new weapon will cruise at more than 2000 m.p.h. at altitudes over 70,000 feet.

Motorola's long record of military electronic achievements led to its appointment as major systems manager to develop and build the B-70's vital Mission and Traffic Control System.

This major system encompasses the communications, navigation, identification (IFF), and landing aids. It will keep B-70 crews in constant contact with each other and with U.S. headquarters from anywhere on the globe. It will provide the Valkyrie with its capability to be electronically directed to a designated target anywhere in the world and be immediately recalled on command.

High-level responsibilities such as this are not new to Motorola. It was in June of 1940 that the prototypes of the history-making Motorola walkie-talkie were delivered to the U.S. Army Signal Corps. During World War II, Motorola not only supplied vast quantities of equipment that kept advancing U.S. ground troops in constant communications, but was also chosen by the Signal Corps to direct and manage the supply of the entire U.S. Army's need for electronic crystals. These critical frequency-determining components were vital to radio communications.

In the late forties and early fifties it was weapon fuses, radar bombsights and tactical microwave communications. Today, in company-owned research and production centers across the country, thousands of Motorola engineers and scientists are at work on a broad range of military projects. Included are missile guidance, high-resolution radar, sonobuoys, the next generation of equipment for radio-telephone communications between ground troops, and advancement of the frontier of knowledge in solid-state electronics.

Motorola's exclusive concentration in electronics, its cost-conscious approach to producibility, and its preoccupation with reliability are evident in every military product from the smallest solid-state device to the most complex weapon systems. Small wonder that with the military, Motorola rates one of the highest confidence quotients among suppliers of electronics equipment. For in the development and production of military electronics, it has been proved time after time, *there is no substitute for seasoned experience.*

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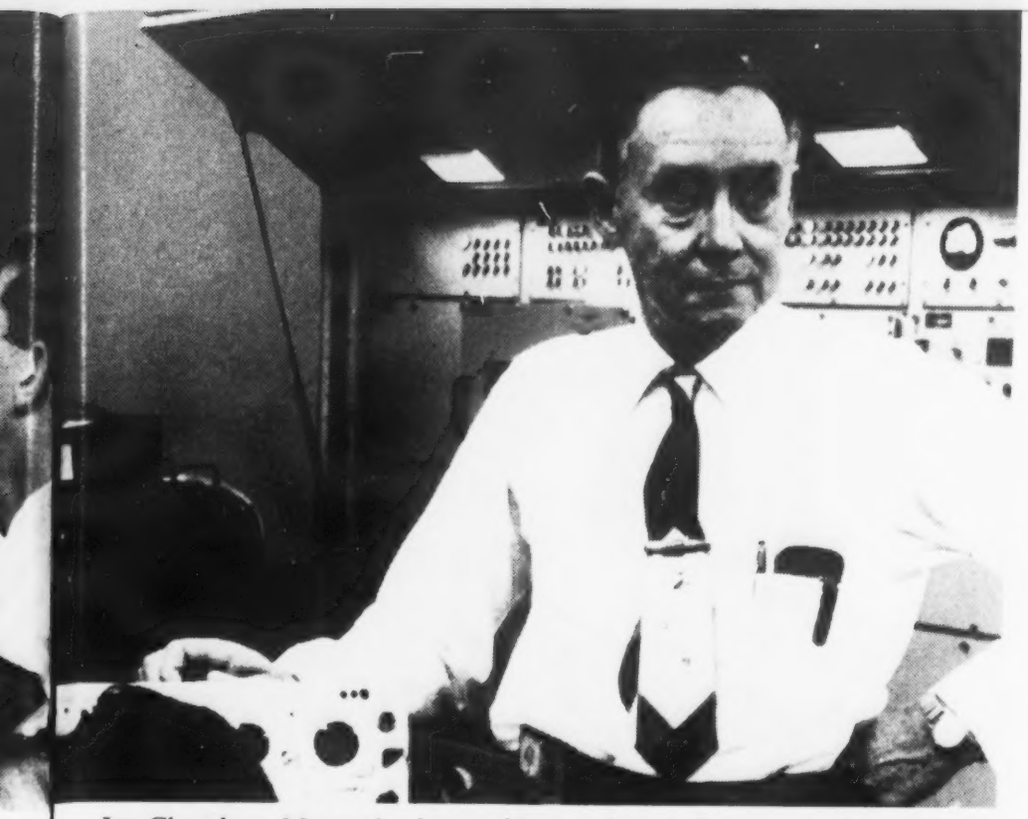

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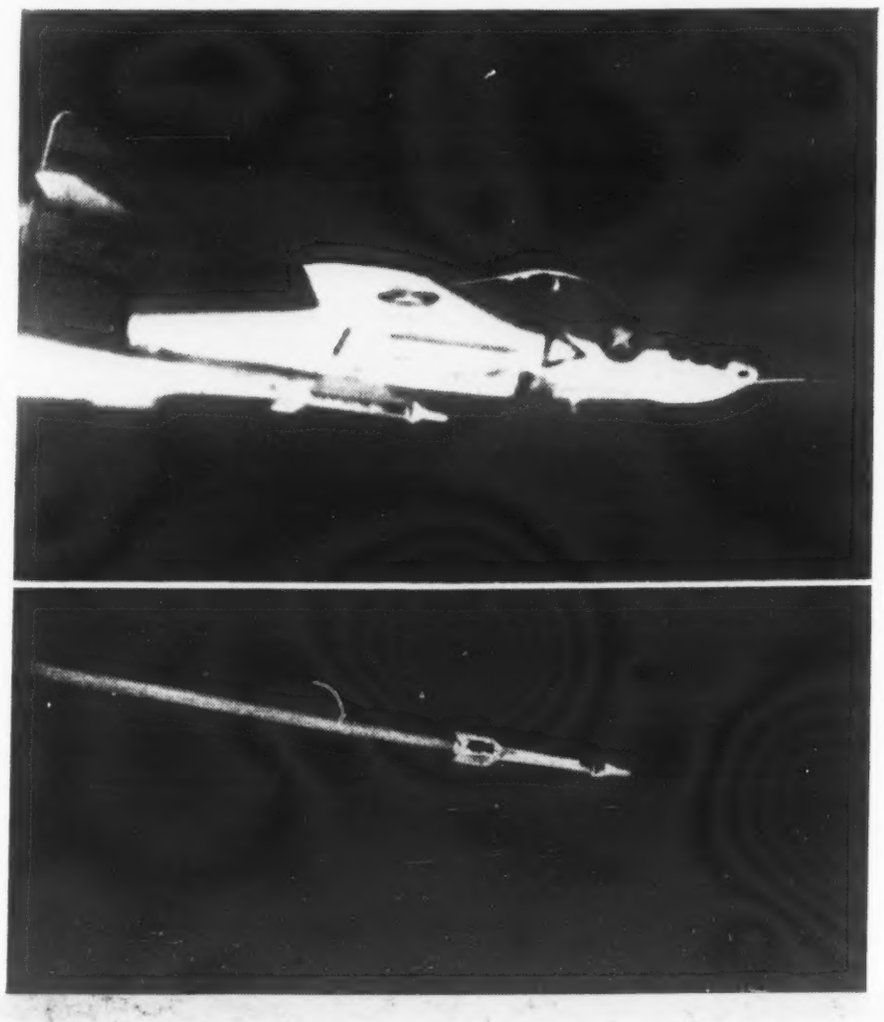

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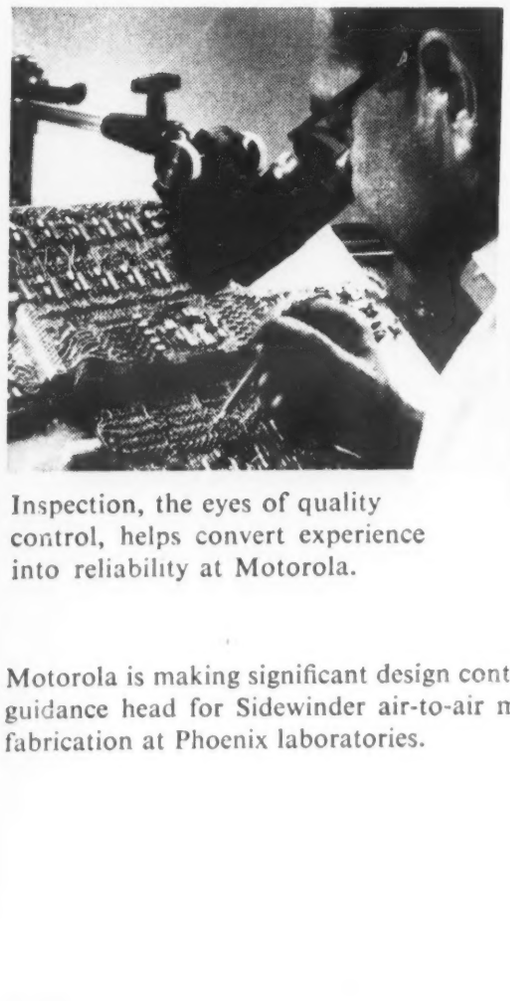

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Signalgram (*Continued from page 44*)

—GENERAL—

ROBERT E. LEE POLARIS SUB will be launched at the Newport News, Va., Shipbuilding and Dry Dock Co., Dec. 18. The fourth nuclear submarine launched in the Navy's program for underseas craft equipped with the Polaris ballistic missile, it will have a surface displacement of approximately 5600 tons and an over-all length of 380 feet. In other developments, three nuclear submarines will be commissioned this month. They are the attack type Seadragon, Dec. 5; the guided missile type Halibut, Dec. 30; the fleet ballistic missile type George Washington, Dec. 31. The radar picket type Triton was commissioned Nov. 10.

IRE 1960 WINTER CONFERENCE on Military Electronics will be conducted on the West Coast for the first time, February 3-5, in Los Angeles. Sponsored by the Professional Group on Military Electronics, the Institute of Radio Engineers' Convention will include both exhibits and technical sessions.

EDISON RADIO AMATEUR AWARD for the most outstanding public service performed by a U. S. licensed ham during 1959 will be presented by General Electric Co. in February 1960. Nominating letters,which may be submitted by anyone familiar with the public service done by a radio amateur, should be sent to the secretary of GE's Edison Radio Amateur Award Committee, Owensboro, Ky., by January 4, 1960.

TWO U. S. PHYSICISTS WON THE NOBEL PRIZE IN PHYSICS for their discovery of anti-protons, negatively-charged protons that can destroy ordinary matter found on earth. Dr. Emilio Segre, 54, and Dr. Owen Chamberlain, 39, both of the University of California made the discovery while doing research with the atom-smashing bevatron at the University in 1955.

A LOW PUMP POWER PARAMETRIC AMPLIFIER for use in solid-state UHF receivers was described at the Electron Devices Meeting, sponsored by the Professional Group on Electron Devices, Institute of Radio Engineers. At the recent Washington, D. C. meeting, it was stated that the 220-mc negative resistance parametric amplifier provides a low noise figure and stable operation.

TWENTY ALLIED SENIOR SIGNAL OFFICERS, representing ten nations, recently completed a tour of U. S. Army Signal Corps installations. Sponsored by the Military Assistance Program, this second annual tour afforded the group an opportunity to see U. S. methods of training and operation. The nations represented were Austria, Brazil, Chile, Denmark, Iran, Italy, Korea, Taiwan, Thailand and Viet-Nam.

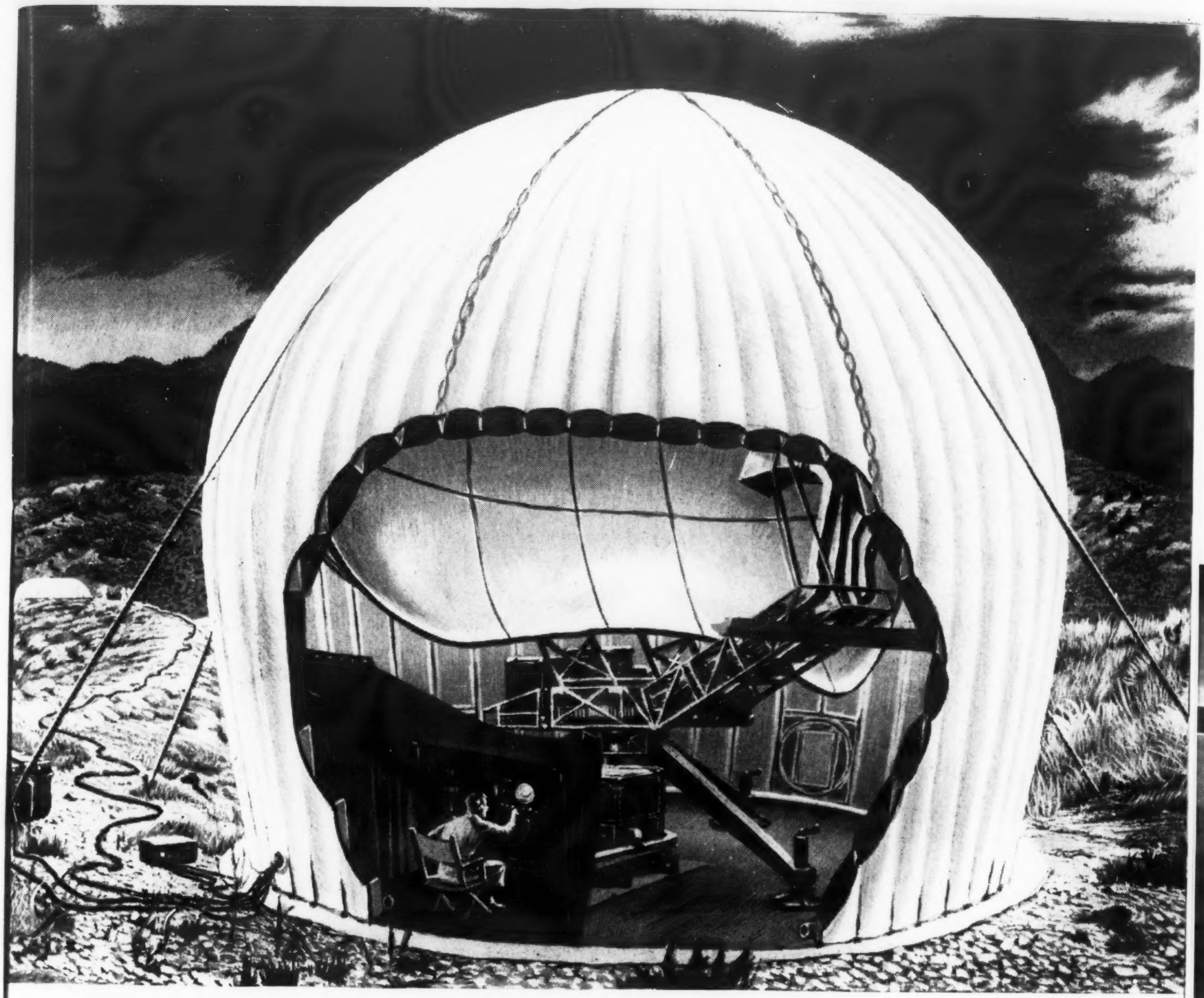
FIRST UNITS OF ADVANCED NEW RADIO EQUIPMENT for the North Atlantic Treaty Organization's new 6,500-mile "Ace High" communications system recently were shipped to Italy. Connecting the free nations of Europe in a wide swinging arc with Turkey, the system "will give NATO its first integrated long distance communications system and will make possible instantaneous and completely reliable transmission of messages." Radio Engineering Laboratories developed the system.

NEW TRANSPARENT COVERING for packaging precision bearings has been developed by Cargo Packers, Inc. Previously, the bearings were exposed to corrosive influences when it was necessary to open the covering to check the bearings. The plastic covering permits the bearings to be seen without opening the covering.

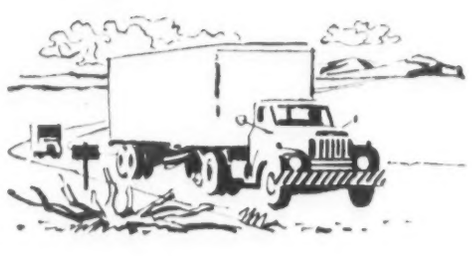
PLASTIC CYLINDERS FOR MISSILES have been developed to replace similar metal structures. Made by Zenith Plastics Co., a subsidiary of Minnesota Mining & Manufacturing Co., the cylinder can reduce costs as the units do not require heat-treated facilities and the subsequent scheduling requirements for metal parts of this nature.

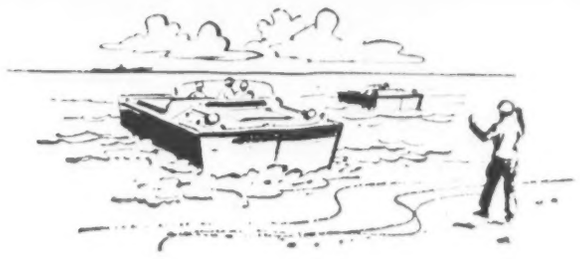
INDUSTRY SHOULD INCORPORATE FALLOUT SHELTERS in all new buildings to match the action taken by the Federal Government in this area, urged the Office of Civil and Defense Mobilization in a recent bulletin. The National Shelter Policy, which holds that in the event of enemy attack fallout shelters offer the best single non-military protective measure for the greatest number of people, directs the Federal Government to provide shelters in new buildings desired for civilian use. State and local governments also were requested to provide shelters.

CALENDAR OF EVENTS:
DECEMBER 7: American Ordnance Association, Annual Armament Preparedness Meeting, New York City.
DECEMBER 8-10: National Conference on the Application of Electrical Insulation, Washington, D.C.
DECEMBER 10-11: Institute of Environmental Sciences Meeting, New York City.
DECEMBER 13-15: Society of Plastic Engineers Meeting, Chicago.
DECEMBER 28-30: Radiological Society of North America Meeting, Chicago.



NOW..."PACKAGED" EARLY WARNING RADAR





Easily transported to tactical areas by land, sea or air it is quickly readied for long and short range action

Easily transportable and quickly operational—that's the new "TEW" (Tactical Early Warning) radar system developed by Sperry's Surface Armament Division for the Marine Corps. Only one-fourth the size and weight of conventional radars, TEW—designated MPS-21—is easily carried to tactical areas by helicopter, cargo plane, truck or amphibious vehicle. Within two hours, an 18-man crew can erect the system and put it into operation.

Designed to detect both close-in and distant supersonic aircraft and missiles, TEW also determines their height—combining the functions of two present radar systems. Operation is almost completely automatic. Only one operator is required to monitor the control console. Radar console and rotating antenna are housed in an inflatable radome, which can withstand the rigors of arctic or tropical climates.

With its very long range and portable construction, TEW provides the means to extend the nation's defense perimeter and insure added protection for key installations and outposts. TEW is another important Sperry contribution to our growing power to deter aggression.

SPERRY

SURFACE ARMAMENT DIVISION, SPERRY GYROSCOPE COMPANY • DIVISION OF SPERRY RAND CORPORATION, GREAT NECK, N.Y.

INTERCHANGING SCIENTIFIC INFORMATION BY MULTI-LATERAL RADIO COMMUNICATION

(Part I in November issue)

by S. EDWIN PILLER, W2KPQ/A2KPQ
Director
First Army MARS SSB Technical Net

In November 1958, Ron Reed, K8AEC, of Tiffin, Ohio, who is director of the Interstate Sideband Net, wrote the FCC inquiring about the possibility of starting a technical net within the ham bands.

The FCC replied that this could be accomplished provided it is carried out in accordance with Rule 12.106 (b) of the FCC regulations. This rule is rather broad. It goes as follows:

"The following kinds of one-way communications, addressed to amateur stations, are authorized and will not be construed as broadcasting . . . (b) Information bulletins consisting solely of subject matter having direct interest to the amateur radio service as such."

Apparently, based on this ruling, technical talks and forums are permissible within the amateur bands provided the subject matter lies within this category.

On December 29, 1958, the Interstate Technical Forum, under the direction of Ron Reed, K8AEC, and Charles Wysall, W8TV, commenced operation with a talk by Wes Schum, W9DYV, a pioneer in the amateur SSB field. I listened to this talk on 3985 kc. and the checkin was tremendous. I heard stations five deep call in from up in Maine down to deep in Florida, and far out into the midwest. There were those, too, who objected and showed it by various attempts to jam the transmissions.

In putting a technical net within the amateur bands, there are arguments for and against.

On the good side it can be shown that this certainly is an intelligent use of the radio spectrum in the public interest, if it is not abused. It is also a spectrum saving device due to the net type operation. It can be further argued that even though MARS is a very worthwhile organization, a man should not have to join it in order to participate in a planned technical forum by radio. I might mention at this time that there are discussions going on to set up a program to permit amateurs to participate only in technical aspects of the First Army MARS, if they have the qualifications. I will elaborate on this later. At any rate, the use of one-way broadcasting within the amateur bands is certainly not without precedent. The American Radio Relay League has been doing it for years by sending out headquarters bulletins and code practice sessions.

On the other side it can be argued that this type of operation could key off a lot of other operations and turn some of the amateur bands, part of the time, into a series of semi-broadcast services. Actually taking the case of the Interstate Technical Forum, I know of no other technical nets within amateur bands that have started in the last four months since the inception of this net.

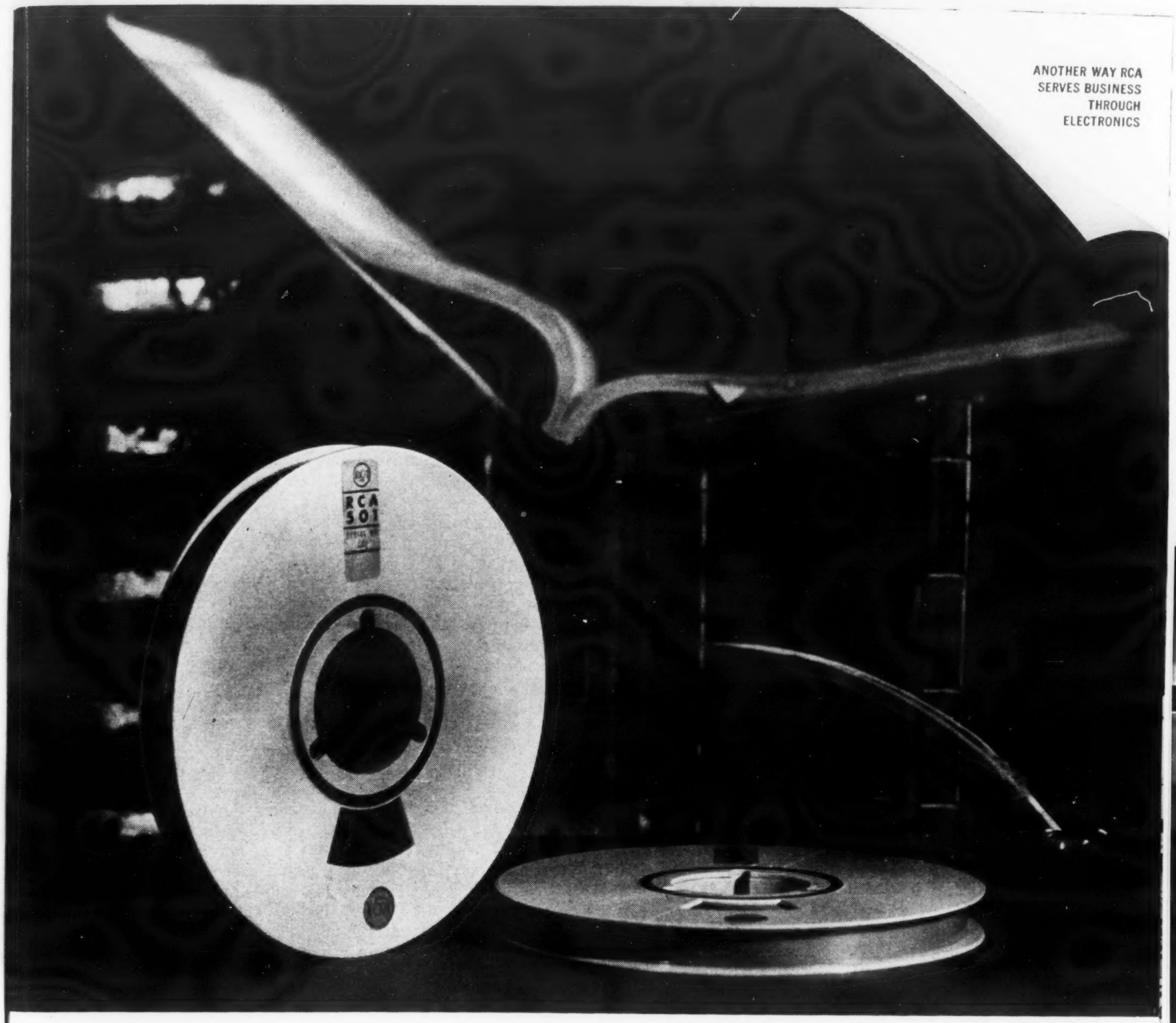
In addition, it might be said that commercial interests could take advantage of amateur frequencies to advertise their products. Actually, I don't feel this has happened and certainly the hams, themselves, would never permit this to occur. Although at times I must admit that there is a very fine line which separates technical information concerning a new product for the amateur fraternity from an outright sales "pitch."

The Interstate Technical Forum meets on the 2nd and 4th Monday of each month at 9:30 P.M. (E.D.T.) on 3985 kc lower sideband. On the first and third Monday of each month the Interstate Ham Clinic meets, presided over by Joe Czerniak, W8NWU, of Muskegon, Michigan. In this operation a panel of experts is on hand to answer any technical problem which any radio amateur might ask.

At the beginning of 1958 the use of visual aids was attempted in conjunction with aural radio lectures in the First Army MARS SSB Technical Net. A selected list of 150 names predominantly MARS members and listeners, who had written for the material, were sent printed matter for use in conjunction with talks on transistors, magnetic amplifiers and a novel SSB receiver design. This was discontinued because of the great amount of work required to make the mailings and also due to the fact that many listeners, not having the visual aids, would receive no benefit from an aural lecture which continually referred to printed diagrams. Later on, printed matter for use with a technical lecture was mailed out with the monthly newsletter by First Army MARS Headquarters at Governors Island. However, all later lectures have essentially been geared to an aural medium.

On November 19, 1958, Gene Ecklund, who was then manager of Automotive Equipment Sales of the Allen B. Du Mont Company, used a novel visual device in his talk on the *Engine Scope*. Gene wanted to get across to his listening audience a block diagram of this instrument. He did this by having the listening audience take a pencil and paper and draw a grid containing 9 equally spaced horizontal lines and 9 equally spaced vertical lines to give 64 boxes. At the top of each vertical column a letter from A to H was assigned. At the left side he assigned numbers from 1 to 8, starting with the top horizontal row and proceeding down. Then by referring to any box on his grid such as B-7, or D-8, he could locate each component of his block diagram. Illustrative of instructions he gave would be, "In box B-6 is a 12AU7

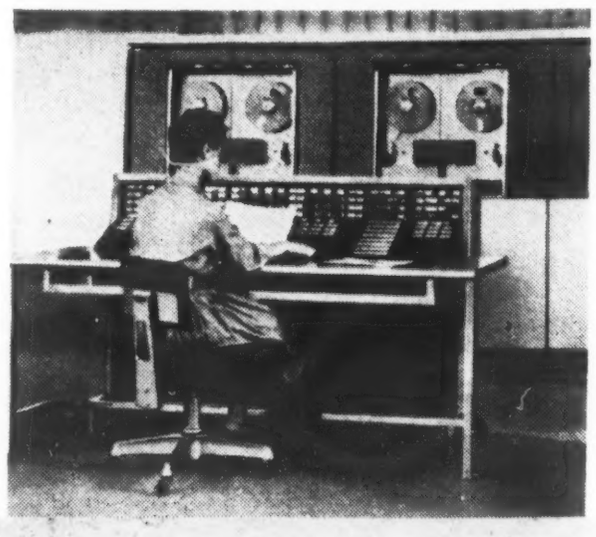
(Continued on page 52)



RCA Electronics creates the "501" to streamline the paper work of business—it reads, writes, figures and remembers on tape

Much of today's traffic jam in paper work is being eliminated by electronic data processing. But to build a system that would be practical and economical for even medium-sized organizations was a job for electronic specialists.

To solve the problem, RCA drew on its broad experience in building computers for military applications and combed its many laboratories for the latest electronic advances that could help. The result was the RCA "501" high-speed electronic data processing system—the most compact, flexible, and economical ever built. It is a pioneer system with all-transistor construction for business use.



The "501" cuts out paper work bottlenecks for many government agencies and businesses, from stock brokerage firms to public utilities, banks, insurance companies, and steel mills.

It "remembers" millions of letters, numbers, and symbols that are "read" onto its magnetic tapes by such things as punch cards and paper tapes. In a fraction of a second, it can do thousands of calculating, sorting, and comparing operations—and checks each step. Finally, it writes such things as bills, reports, payrolls in plain English at 72,000 characters per minute.

This economical and practical answer to an acute business problem is another way RCA Electronics is helping to simplify the growing complexity of business.

RADIO CORPORATION OF AMERICA

cathode follower. This ties into a pulse amplifier in Box D-5," and so forth. It was quite effective in doing the job he desired.

Perhaps the best use of the aural medium for transmitting schematic diagrams was demonstrated by a person who depends on it for a good deal of his communication with the outside world because he is blind. Bob Gunderson, W2JIO, Editor of the Braille Technical Press, and teacher of the blind at the New York Institute for the Education of the Blind, gave two talks on the First Army MARS SSB Technical Net. On Jan. 21, 1959, Bob delivered a talk on phone patches. In the course of this talk he had occasion to describe in words several circuit diagrams. His aptness in doing this, of course, comes from the fact that he has had many years experience in communicating complex diagrams by words. This is the method used by the blind. It is evident that we with sight, in using only an aural medium, can learn a lot from blind.

Ling Electronics Company recently announced a ham TV transmitter capable of 30 watts output in the 420 to 6450 mc. region. Obviously this wide band system would not be practical in the high frequency range. However, some narrow band facsimile system or some slow scan television system which could transmit diagrams and possibly even pictures during a technical lecture is definitely desirable.

A device, which for now we'll call an electronic blackboard, may be the answer. Most of us have seen in operation an instrument which is manufactured by the Tele-Autograph Company of Los Angeles, which is used at airport reservation desks, hotels and other places for transmitting handwritten information. This is accomplished by taking the X and Y components, that is the horizontal and vertical, and translating them into D.C. voltages or audio tones. These voltages are then fed down a line to a remote location where they are reapplied to an indicating device. There seems to be no reason why an instrument such as this cannot be used to transmit handwritten diagrams through the radio medium. To those amateurs who are looking for new fields to conquer in amateur radio, the development of a simple cheap device for transmitting handwritten information by radio, such as the electronic blackboard, should be a challenge.

Factors Involved in Technical Net Organization

There are three factors involved in establishing a technical net. They are manpower, frequencies, and radio communication equipment. A technical net residing in the First Army Area and operating on a clear channel, such as this, can cover, with a fairly reliable skywave transmission, a 1000 mile radius of New York City on a large percentage of the nights. Within this area resides well over half the population of the United States.

Speakers can be obtained from among the engineers, scientists and teachers in our industries, schools and government laboratories. Qualified radio amateurs can also give talks.

An important aspect of any good technical net operation is the fact that it should be properly publicized. I have found the editors of most leading electronic publications more than happy to publicize the activities and schedules of the First Army MARS SSB Technical Net.* Of course, releases have to be mailed out about two months in advance in order to meet the lead time requirements of most monthly publications.

I have found industrial companies glad to accept collect long distance telephone calls to any part of the country when originating speakers by telephone patch.

As an example, we scheduled a talk on October 8, 1958, on *Characteristics of SSB Power Amplifier Circuits*, by Warren Bruene, Technical Consultant, of the Collins Radio Company in Cedar Rapids, Iowa. This talk was broadcast from a tape recording from this station. Following the talk, a long distance collect call, with Mr. Bruene's permission, was put through to his home in Cedar Rapids from New York City and he was able to talk to the net during the question and answer period through the phone patch at my station. The total cost of the telephone call, which lasted one-half hour, was approximately $10, and Mr. Bruene certainly must have reached a large audience. These same companies have no qualms about sending a speaker clear across the country to address a small audience at a cost of many hundreds of dollars.

As this net operates without any budget from the Army, ways have to be found to keep our expenses down. Other operations have resorted to a "kitty" which is filled by donations from the net members. We, fortunately, have not found this to be necessary.

In conclusion let us gaze into a crystal ball to see what some of the future possibilities are for multilateral radio communication as used for communicasting. There is no doubt that any type of aural and visual communication that is achieved in a lecture hall could also be done by radio nets. Aurally, we are doing fairly well. The challenge to the radio amateur is to devise simple, inexpensive, narrow band devices for transmitting visual information. Surplus facsimile machines will soon be available which might be the answer. Other devices should certainly be tried.

I urge my fellow radio amateurs to find ways to use their radio facilities for interchanging scientific information by multilateral radio communication.

We are in the stone age of multilateral scientific communication by radio. I look forward to the day when the Federal Communications Commission will allocate a band of frequencies wherein professional groups could organize radio forums for the exchange of information in scientific, technological and other fields. This could eliminate the problems of time and distance in getting some of our foremost minds to communicate by radio and thereby educate a listening audience.

Radio amateurs have always been dedicated to public service and nonpecuniary operation. Educational radio has always lagged due to inadequate financial support. On the one hand, we have this tremendous need for intercommunication by the scientific groups. On the other hand, we have a great communication potential available in the hands of close to 200,000 radio amateurs in this country. All that is necessary to bring the two groups together is the magic catalyst of an organizing force and the availability of some clear channels, on a part time basis, adjacent to the amateur bands.

I have discussed the formation of a technical program within First Army MARS with Captain Joseph Fischler, the MARS director of First Army. We would like to hear from qualified men residing in the First Army Area who are teachers, engineers, technicians, or have other qualifications and would be interested in participating in a technical education program using radio communication for forums and lectures. I would also like to hear from any readers who might be interested in forwarding to me any comments they might have regarding the subject matter of this paper.

*SIGNAL Magazine has been pleased to carry the word on 1st Army MARS activities.

NATO SELECTS EIMAC KLYSTRONS TO POWER EUROPE'S LARGEST TROPO-SCATTER NETWORK

One and ten kilowatt amplifiers in NATO's continent-spanning tropo-scatter system will be Eimac Amplifier Klystrons. Since Eimac Klystrons first made large-scale tropospheric communications possible in 1954, they've become famous for reliability in all major tropo-scatter networks: Pole Vault, Dew Line, Texas Towers, White Alice, Florida-Cuba TV. Individual Eimac Klystrons have logged more than 35,000 hours continuous air time in tropo-scatter service.

Exclusive design features make Eimac Klystrons outstanding for tropo-scatter. Extra-wide frequency tuning is achieved with one set of tuning cavities. Inductive tuning achieves uniform bandwidth plus greater broadbanding by external cavity loading. Eimac's external cavity design lowers original cost, and replacement cost is lower since tuning circuitry is purchased just once.

One wide range load coupler covers the entire frequency range. Eimac's series connected body magnets permit use of one power supply, one control for body magnets.

Eimac Klystrons will be used in NATO installations. Proved Eimac reliability will aid in safeguarding the security of all free European nations.

EITEL-McCULLOUGH, INC.

Eimac®

San Carlos • California

The Astronauts Speak Out

(*Continued from page* 20)

(EDITOR'S NOTE: The "Little Joe" and the "Big Joe" are projects involving the launching of booster rockets for space capsules. Since the September 9 firing of "Big Joe" was successful, no further shots are planned for the near future. The first successful launching of "Little Joe" booster rocket hoisted a dummy space capsule October 4 and there have been other shots since then.)

We will fire when we are ready. Obviously we have a schedule, but it is for purposes of trying to deliver hardware, this sort of thing. It must be dependent upon proof. If we prove out the equipment, then we will get ready to fire.

Question: Was this morning's (Sept. 16) Jupiter test connected with the flight support system at all?

This was with 10 or 14 pregnant mice and other animals at Cape Canaveral.

Powers: That particular test was a space-available basis, just like the monkey was. They are using biopacks. Although we get aeromedical data from them, they have no direct relationship to Mercury.

Glenn: I think we can say that almost any test that has a living organism aboard is of great interest to us. You notice that the roster of aeromedical people are at Langley in the Space Task Group, and those people are continually visiting the sites and participating in these tests. There is our fund of information. This is all fed into our own individual problem.

Question: Mr. Shepard, on the recovery system, is the Mercury Project committed to a capsule and parachute, or is it possible that the project as developed may turn into a glider recovery system?

Shepard: Insofar as Project Mercury is concerned, we are dealing with a pure ballistic or drag vehicle. As you know, generally after the re-entry phase has been completed and the parachutes deployed, the parachute descent is made for landing. What we are calling Project Mercury includes only this type of vehicle.

Question: In your specialization in this field of recovery, do you make recommendations to maybe future projects for two-man capsules, different types of recovery, or are you primarily concerned with this project?

Shepard: We are primarily concerned with the Mercury Project. That is our immediate objective. When you consider what we do afterwards, what recommendations we make, I think your imagination can be anywhere. As you know, seven of us are still in the military. We have been loaned to the NASA for the purpose of this Project. As such our inputs are primarily technical, directed to the Project itself. Whatever recommendations we make after the Project is over are anybody's guess.

We talked about the X-15 for a few minutes. We like to look at it this way: the X-15 is a lifting vehicle and provides finite control for picking out a landing area. People have asked us a couple of times how we feel about these two philosophies of a lifting vehicle versus a drag vehicle. We feel that actually there are probably two areas where they can be used. You can use a lifting vehicle for VIP transportation and a drag vehicle for the peons.

Ritland: I would like to add to this general statement. The X-15 and the Mercury Project Dyna-Soar—the Air Force project could be considered a follow-on or combination of the X-15 and the Mercury, namely, a boosted lifting re-entry vehicle. This, of course, is in the planning stages and is just about to get started but would be what you could call the next generation of the combined X-15-Mercury program. So all of these contribute to the future objectives of the country in operating in space with the lifting re-entry vehicle.

Glenn: I would make one additional comment on this, to get back to the design of Project Mercury. What we are trying to do is just see what a man can do in space, trying to put a man in orbit under these conditions of weightlessness, under real controlled conditions and find out what his reactions are and what happens to him up there, for instance, so we will know how to design future vehicles.

On the X-15 they are working a little more on the control system aspects of it under controlled conditions for a lifting vehicle, and as such we may eventually combine both these ideas in future space vehicles with what we found out about how the man operates in this condition—that is something they are not going to get into with the X-15. Still, they are going to have more experience probably than we will have in some aspects of the aerodynamic portions of re-entry and control.

So these programs go along hand in hand and will be combined later on here into projects that we probably will all be in on the design of with information we have gotten in our respective programs.

Question: Colonel Glenn, in a certain period of time this program will be completed. What would you picture your role to be after that? Go back to the Marine Corps, or what would you do?

Glenn: That is a real good $64.00 question. We don't know. We haven't been given any future outline of what our duties will be at the end of this program. We are enough concerned with this one right now that we are not worrying about that too much. We hardly envision, though, that we are going to get done and be the highly trained nucleus of people that we will be at a time when this project is done and then be snatched out of it and put back as Club Officers at Cherry Point, or something like that. It is possible but we think at least improbable at the moment. And I am not casting aspersions on Club Officers at Cherry Point.

Question: Are the Astronauts satisfied with the Project Mercury to date? Is the Project Mercury on schedule?

Glenn: Yes.

Cooper: Let's put it this way: Yes, we are satisfied. Nobody should ever be completely satisfied with any test progress. He should always seek for better. I think that we are satisfied that we are moving along satisfactorily on it. However, everybody would like to see us progress faster, naturally.

Powers: I think the answer to the second part of your question is that essentially we are on schedule.

Question: Do you think that the Russian space achievement will have any bearing on your program? More money?

Glenn: It will affect it if they will give us the information they have.

Powers: He is talking, I think, more in terms of whether we will get more money or more support.

Cooper: Do you mean as far as public opinion?

Powers: This depends a great deal on what you gentle-

(*Continued on page* 56)

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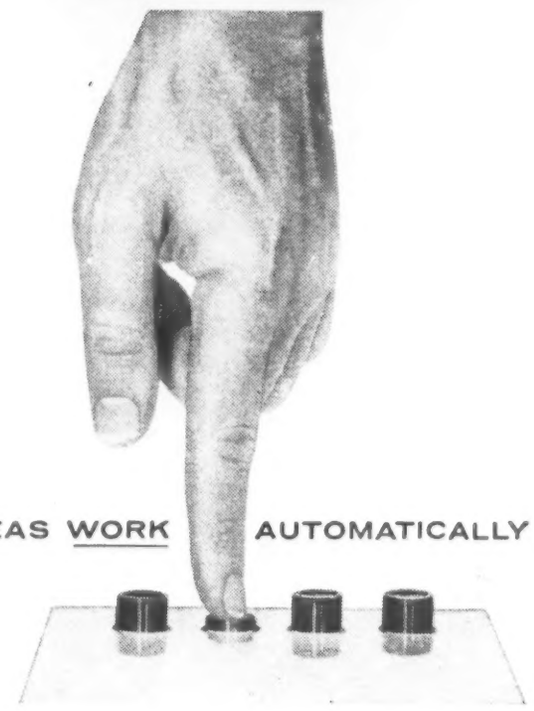

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men do and how you do it. We are moving along as fast as technology, our skills and our brain power will let us. The reaction to the Russian achievement is something over which we don't have any control.

Glenn: We are not in a drag race with the Russians on getting a man into space. We are not going to put a man up there in a can just hoping to get him back, like—well, I won't say that they will do this, either. We won't go until ready whether the Russians go tomorrow, the next day, or a day ahead of us or a day after us. We will go when our project is good and ready to go.

Question: Do you have any information on the Russians having a counterpart to your group, undergoing similar training?

Glenn: We have heard that they exist, but this is just what we read in the newspapers.

Question: I am not sure that I understand what you mean when you say that you are not in a race with the Russians.

Glenn: We are not running a competitive man-in-space program with the Russians. We want to get there as soon as we can, naturally. If we beat them, fine. That is a feather in the American side of the cap, I guess.

But on the other hand, we have had more or less words put in our mouths sometimes in the past, so far on the program—attempts were made, anyway, to put words in our mouths—to the effect that we were all out to beat the Russians. And the implication was that maybe we were cutting corners trying to get there first and we are sacrificing a little safety to get there first, and this is not our intent at all.

This might be likened a little bit to the first Sputnik firing. There was a big flurry and a lot of action and so on. But looking back on it now I think that our space program in this country has come along in a much more orderly progression since then, and we have probably more technical information now than the Russians have gotten since then, even though there was a big flurry and they made the initial impact on world opinion by doing the first shot.

But as far as who is ahead now with technical information, I wouldn't say that they were ahead now just because they made the first shot. Our man-in-space program is the same way. It is laid out as an orderly progression to get us information, and we are not in any big race where we have to beat them to the wire.

Powers: I think that on behalf of the Space Task Group it is fair to say that we are not unaware of the significance and importance of getting there first, but it is not our only motivation.

Glenn: We are not cutting corners.

Question: I would like to address this to anyone, if I may. Within the past 24 hours a very prominent man in rocketry (Dr. Wernher von Braun) has made public statements in the southern part of the United States—you can guess who he is—that we have complacency and red tape which are slowing us down in the field of rocketry. I would like to ask any or all of you if, looking at it from your point of view, you feel this red tape and if you are becoming enmeshed in it, and if you feel that complacency is holding you back? Do you agree?

Schirra: I would like to answer that. Probably the most impressive visit we have had up until now is a visit to Huntsville, Alabama, to see the feverish activity of the group there, their intense devotion to the work, and the results that they have had; and the other parts

of the program, the way the Atlas program has been doing so well with the intense effort and great work that they have done; and the other shots that we have had, the "Little Joe" shot that went off, and we have had the "Big Joe" shot, which was quite a thrill to us to see how well it worked out.

I don't see how anyone could legally, or even logically make a statement like that, realizing the great successes we have had; if the man would go around and see where these people are working, and the tremendous effort that is put out in the activity, I don't see how that opinion could be ventured.

Powers: I think we are talking about two different areas. At our level — and you can all disagree with me if you choose to—so far in our program the cooperation, work, response and support that we have gotten from every agency in the country has been almost overwhelming. There has been no demonstration of conflict with regard to separate services or separate agencies or anything else.

I think that Dr. von Braun was talking about the high management finding and procedural matters as opposed to our working level situation. At our level we don't see it.

General Doolittle: I would like to dare to take a look in the future. Certainly our Astronaut program, from the point of view of propaganda, publicity and national prestige, is a very good thing. I see much more than that behind it. They tied in this morning the Astronaut program with the X-15. General Ritland tied it in with the Dyna-Soar.

You may remember that there was an Institute of Aeronautical Sciences meeting here about two months ago. Out of that came a belief that the next step in commercial air transportation would be to a Mach 3 airplane. There are Mach 2 airplanes and better flying today.

(Editor's Note: Mach is the ratio of the velocity of a body to that of sound in the medium being considered.)

The best commercial airliner is a little under Mach 1. There is no apparent percentage in a Mach 1½ or Mach 2. There are on the drawing boards and under production two Mach 3 airplanes today, one a fighter and one a bomber. Those airplanes, in my mind, will lead to the Mach 3 transport, and that is the next step in air transportation.

I envision not maybe in my lifetime, because there isn't a great deal of it left, but certainly in the lifetime of you people, a Mach 15 transport. That will be an air transport that will start in the earth's atmosphere, go outside of it, and re-enter, so that your trip from New York to Paris will take you thirty minutes. This is the thing that in my mind these Astronauts are leading to.

General Ritland: I think the term "complacency" on those projects that are approved and under way, is the responsibility of the people that are managing the program. I would say that in our department there certainly is no complacency on projects that are approved.

With regard to red tape, you can always make a general statement: There is always too much red tape. This is a standard statement. In space there are so many things that can be done and that probably should be done, that when you balance this with the budget and what you can afford, it is impossible to do them all. So you get into the selective process of what is the best thing to do. And this is where you get the loads, and you might say red tape. But once a program is approved and funded, then it is our job to get it done. I couldn't say that in any of our work there is any complacency in this complex.

Question: I would like to double up on this. First, your one-vision out is the periscope. Are there any turrets planned in the capsule, transparent ports that one can look out, if you pardon the expression, with the naked eye?

Shepard: Yes. Actually, the periscope that you just mentioned can be used for two purposes. It can be used as a navigation instrument, also for general observations. It encompasses several items.

In addition to that, which can be interpreted to be a back-up, if you will, will be a port through which the pilot can view the surroundings. The port is a fixed window. It has to be very carefully designed because of structural and heating considerations. Even though it is fixed, the pilot will have the capability of locating the capsule in various attitudes so that he can observe through this fixed window in whichever direction he desires.

Of course, I think you can realize that this is a back-up, using the naked eye, for any kind of a flight attitude or rate-indicating system.

Question: Is this true of all the control systems? Are these control systems within the capsule—will actual control, for instance, be the firing of the retrorockets, the reversing of the capsule—all that will be controlled from the ground, will it, except—

Shepard: Yes. The determining criteria in the design of the entire system—Atlas, Redstone, and Mercury capsule—is reliability. This has become a very important consideration. Insofar as it is possible in the state of the art, within weight considerations, we are providing parallel systems, one to support the other. There will be provisions for ground commands to reorient the capsule, and these ground commands can be parallel blocked or instituted by the pilot.

Question: So far the whole thing is planned to be preprogrammed and autopiloted, with the pilots manual only as the backup. Isn't that the general philosophy?

Shepard: That is the general engineering philosophy.

Schirra: As we go farther with the program we will be doing just that, though; going into manual to see whether we can do it. With the X-15 their reaction control jets will permit them to penetrate space and return, and then they will have to go back to normal aerodynamic control. We will stay in orbit with almost identical three-axis control jets and maneuver—not changing orbital path, maneuvering in the orbital path.

Question: In attitude?

Voice: In attitude.

Question: Is sufficient gas provided for a definite finite time of maneuver?

Schirra: As it is designed now, there is more than enough to withstand as long a mission as we have planned for the Mercury capsule.

Question: In a continuing attitude change, or in obtaining a number of fixed attitude changes, or what?

Schirra: That depends—there is a certain volume that you have, you could go in there and put in full control, and obviously you will dump it out faster. If you make small changes, as an automatic system would do, you will probably use less fuel per minute or increment of time.

where's Charlie . . . Madrid? . . . Tokyo? . . . Sault Ste. Marie? Wherever he is, as a Bendix Radio Field Engineer, he's helping a satisfied customer get top operational return on equipment investment. Our Field Engineering organization—more than 1100 people strong—is world-wide in scope, quick in reaction. It is a vital element in Air Force Air Defense radar—a program for which we operate 12 depots, 10 of them overseas. It operates, maintains and supplies the satellite tracking network for NASA. Recently, we were awarded a contract for ground sub-systems for Project Mercury. For the best field engineering available—from black box repair to complete systems support—contact us at the following address.

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Association affairs

New Group Member

Decca Navigator Company Limited, a British firm engaged in air electronics work, has joined AFCEA as a group member. The company is located at 9, Albert Embankment, London, S.E. 11, England.

Company representatives are: H. F. Schwarz, Managing Director; H. G. Hawker, Commercial Director; J. G. Adam, Manager, Air Division; D. G. T. Hayes, Squadron Leader; R. T. Duck; E. Hayes; R. J. Mitchell; C. Powell; J. Vickers; W. St. J. White.

Contributing Editor Accepts New Post

Thomas E. Gootée has become Assistant Director of Maintenance and Operations for Page Communications Engineers, Inc., after a 17-year civilian-military career with the Army.

A Contributing Editor to SIGNAL, Mr. Gootée has written several articles about the Army's latest electronics systems. Mr. Gootée formerly was civilian chief of the Office of Technical Liaison, Office of the Chief Signal Officer.

Visitors at National Headquarters

During the past seven weeks several AFCEA members have visited National Headquarters. They are Directors W. W. Watts, Theodore Bartlett and Joseph Heinrich, Region B-1 Vice President George C. Ruehl, Jr., Region D Vice President Harry Reichelderfer and Chapter Presidents Norman Freeman of Fort Monmouth and Sam Freedman of San Diego.

Services for Sustaining and Group Members

AFCEA has inaugurated two new services for sustaining and group members.

Beginning this month, a column devoted to industry positions available is being carried in SIGNAL. Sustaining and group member companies may submit personnel listings and persons interested will reply directly to the company. (See page 82.) This column will supplement the Positions Available section in which individual members submit job-seeking notices.

To aid in making industry aware of the military's needs, the Advisory Group on Electronic Parts, (AGEP) Office of the Assistant Secretary of Defense has published a booklet which explains the work being done by the AGEP. National Headquarters has made arrangements with Allan M. Hadley, Deputy Secretary of AGEP, whereby copies of this booklet entitled "The Capsule Summary of the AGEP Program" have been sent to AFCEA sustaining and group members. It is felt that this service will provide companies with needed information.

New Sustaining Member

International Telephone & Telegraph Corporation has transferred from group membership to sustaining membership. The third company to become a sustaining member, ITT has named 35 representatives as AFCEA members.

They are: H. S. Geneen, President, ITT; F. R. Furth, Vice President, Research and Engineering, ITT; C. D. Hilles, Jr., Executive Vice President, ITT; M. S. Klinedinst, Acting Director of Marketing, ITT; O. S. Ostberg, Manager, Research and Engineering Administrator, ITT; K. E. Fields, Executive Vice President, International Standard Electric Corp.; C. M. Mooney, Director, Government Relations, ITT; R. V. Mrozinski, Government Relations Office, ITT; O. W. Lunde, Government Relations Office, ITT; J. W. Guilfoyle, Executive Vice President, Federal Electric Corp.

Other officials include: R. Marshall, Director, Marketing, Federal Electric Corp.; W. G. Donaldson, Assistant Manager, Engineering, Federal Electric Corp.; F. H. Guterman, General Manager, Industrial Products Div.; C. M. Aker, Industrial Products Div.; P. R. Roehm, President, Intelex Systems, Inc.; I. Sattem, Director, Operations, ITT Communication Systems, Inc.; E. J. Whalen, Director, Contracts Administration, ITT Communication Systems, Inc.; H. G. Busignies, President, ITT Laboratories; H. V. Evans, Manager, Electronic Systems Planning, ITT Laboratories; G. E. Howarth, Senior Product Engineer, ITT Laboratories; J. V. Burke, Manager, Customer Relations, ITT Laboratories.

Also listed are: R. T. Cowden, ITT Laboratories; D. L. Mills, President, ITT Federal Div.; T. M. Douglas, Vice President, ITT Federal Div.; J. E. Phelan, Sales Manager, ITT Federal Div.; D. M. Sullivan, Director, Planning, ITT Federal Div.; C. Haltof, Regional Sales Manager, ITT Federal Div.; F. M. Viles, Jr., Vice President, Marketing, ITT Components Div.; G. A. Strichman, President, Kellogg Switchboard & Supply Co.; L. Olszyk, Public Relations Manager, Kellogg Switchboard & Supply Co.; W. F. Boyd, Vice President and General Manager, Kellogg Switchboard & Supply Co.; T. P. Leddy, Vice President and Director, Government Relations, Kellogg Switchboard & Supply Co.; O. C. Bailey, Vice President and Director of Sales, Kellogg Switchboard & Supply Co.; S. Luke, ITT Communications Systems, Inc.

NEW AFCEA MEMBERS

Listed below are new members of the AFCEA who have joined the Association during the month of October. Members are listed under the Chapter with which they are affiliated. The November listing will appear in the January issue.

Arizona

Raymond J. Smith

Atlanta

Hugh C. Dacosta
Herbert H. Nobles, Jr.
Bernhard F. Strand
James H. Hicks
H. Phil Myers, Jr.
Robert J. Oliver
James P. Allred
Thomas A. Pouncy
Edwin O. Betscher
Kenneth G. Byers
Ronald C. Sandifer
Arthur H. Harkleroad
James E. Henderson
Howard A. Samuelson
Thomas J. Smith
Claude H. Blount, Jr.
Edgar M. Holberton
W. D. Kyser
Thomas E. Wallace, Jr.
William F. Shate
Plato S. Rhyne
Thomas A. Rivers
William F. Rambo

Augusta-Fort Gordon

1st Lt. Donald R. Stallings
Capt. James A. Carlile
1st Lt. Robert G. Foster
Capt. Garry R. Spencer
Capt. Myron M. Motsko
Maj. Harry A. Nicoll, Jr.
Lt. Col. Jack E. Willis
M-Sgt. Louis E. Schadt
Sgt. James N. Witherspoon
Capt. Russell E. Bennett
1st Lt. William Reilly
M-Sgt. Floyd C. Simmons
1st Lt. Billy H. Taylor
CWO-3 Lawrence L. Wilson
Larry R. Harding
2nd Lt. Jack E. Squier
2nd Lt. Thomas C. Baird
Capt. Clyde D. Merrick
1st Sgt. Leander Egan
Maj. Wayne W. Rouse
Sfc Albert Cohen
M-Sgt. Albin J. Ebi
2nd Lt. William S. Armistead
Capt. Randolph C. Bourgeois
Capt. Stephen T. Szemcsak
2nd Lt. George D. Vickers
Col. William A. Glass, Jr.
Lt. Col. Jack N. Niland
Col. Francis C. Bowen
Maj. Paul G. Stuckart
LCdr. Leonard R. Massengale
Lt. Col. Lyle E. Widdowson
Maj. James A. Green
Capt. Theodore E. Wasko
Sgt. Jimmy L. Sigmon
Sfc. George A. Dukes
M-Sgt. Albert P. Yount
M-Sgt. Orville Eastwood
2nd Lt. Joseph A. Johnson, Jr.
William T. Kavanauh
Andrew Larusso
Maj. Ariel T. Johnson
Lt. Col. Elmer F. Gahnz
Capt. William A. Lancaster
Capt. William A. Hoffman
1st Sgt. Allen R. Kline
CWO George V. Luellman
M-Sgt. Robert H. Barton
Capt. Walter W. Smith

Baltimore

Steven J. Takacs
Melvin G. Snyder
LCdr. Leister F. Graffis
John S. Andoniades
David C. Abbott
Donald F. Mahoney

Boston

Ronald Reynolds
Aaron Levine
Clifford A. Bean
Capt. Stuart W. Birch
2nd Lt. Gerald A. Bonta
1st Lt. Jack A. Lucido
Milton Ratynski
Roger G. Long
Dexter A. Picozzi

Chicago

J. E. Anderson
D. MacGregor
O. E. Wagenknecht
Capt. Daniel L. Thomas
Eugene L. Davis
Robert G. Frank
Carl L. Scheirman
Robert Van Cleve
Aaron Aronson
Emil Skocypec
G. A. Strichma
L. Olszyk
W. F. Boyd
O. C. Bailey
T. P. Leddy
Arthur J. Giraldi
Richard C. Buck
Donald W. Ruden

Dayton-Wright

Keith McRitchie
Claude L. Nieckerson, Jr.
Ralph C. Herrlin
Joseph R. Convoy
Maj. Charles H. Nelson
John M. Malloy

Fort Monmouth

2nd Lt. Bernard S. Landman
Joseph O. Wilson
Frank P. Schiro
Hans K. Ziegler
John C. Goodchild
Otis L. Evans
Lt. Col. Harry I. Luftman
Col. William R. Blair
Gerald J. Barton
Gilbert Hayden
William C. Cacciatore
John D. Deisler
Harold H. Beizer
Francis W. Ducey
J. Vitola
R. Gamble

Frankfurt

Capt. Frederick P. Tawney

Gulf Coast

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Merrill L. Jay
Cdr. Robert B. Linvile
Joseph L. Ruple

Hawaii

Reginald H. Goring
Joseph M. Lynd
Edward C. Schoen
Thomas A. Aguiar
Alphonse Micheli, Jr.
Charles K. Suzuki
Oradiah V. Hanuna
David L. Grubb

Kansas City

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Robert E. Harvey
Harold W. Keairnes
Frank C. Wright
Maj. Zenon W. Dembitsky
Charles W. Horne

Lexington

Laurence L. Moon
Omer T. Booth
Charles W. McIntire
Adolph A. Abraham
Capt. John S. Bailey
Maj. Edgar D. Brooks
Harold W. Fann

Louisiana

Will S. Temple, Jr.
Floyd P. Hargus

Montgomery

Lt. Col. Julian W. Martin

New York

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C D. Hilles, Jr.
M. S. Klinedinst
K. E. Fields
J. W. Guilfoyle

Robert Marshall
W. G. Donaldson
S. Luke
Vernon A. Radom
Sam I. Kratter
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Michael S. Helfer
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M. B. Smith
Raymond A. Kogge
William C. Bechtle, Jr.
Ralph A. Meola
Lawrence Leist
Emanuel L. Strunin
Robert H. Weber
Julius Sainz
George Ronkin
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W. G. Bain
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Andrew W. Hamilton
Alfred W. Kupferschmid

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Capt. Edmond J. Borkowski
Kent W. Linke
Ervin J. Kofler
Byron S. Hindman
Seth Palagi
Charles R. Hoover
Edgar L. Jenkins
Robert R. Carson
Capt. Robert A. Frederick

Capt. Charles F. Hudson, Jr.
Capt. Tarlton A. Guyote
M-Sgt. Marion E. Newman
SM-Sgt. James A. Simmons
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Lambert A. Lang

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James L. Elswick
Maj. Carl W. Elder
Don A. Tappana

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Roy E. Terry

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Capt. Frank Dwight
2nd Lt. Martin Bruce
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S. Brown Sanders
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Walter C. Dietz
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Col. Patrick B. McCarthy
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L. Silverstein, Jr.

Tinker-Oklahoma City

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Tokyo

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Col. Hugh Winter
Cdr. Howard F. Wiley

Washington

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Murray B. Jones
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G. H. Rathe, Jr.
V. A. Tauber
T. Horton
T. C. Odom
J. B. Jackson
Mathew Gradet
Richard A. Smith
Charles Emsweiler
Col. Henry R. Sanford
Cdr. Frank C. Bolser
R. V. Mrozinski
O. W. Lunde
Hugh C. Henline

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R. Whelan, Owego, New York
Lt. (j.g.) Michael J. Sawicki, Houston, Texas
Rear Adm. Thomas F. Halloran, Thomasville, Georgia
William C. George, Cleveland, Ohio
Walter J. Hood, Cleveland, Ohio
David P. Ernest, State College, Pennsylvania
Paul F. McCarville, Milwaukee, Wisconsin

AFCEA Sustaining and Group Members

Communications—Electronics—Photography

Listed below are the firms who are sustaining and group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

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*

Translation

Kansas City: Special observation #4, 1500 feet scattered clouds, measured ceiling 2500 feet overcast, visibility 4 miles, light rain, smoke, sea level pressure 1013.2 millibars, temperature 58°, dewpoint 56°, wind south 7 knots, altimeter setting 29.93 inches, pilot reports top of overcast 5500 MSL, rain began 5 minutes past the hour, overcast occasionally broken, runway 25 visual range 3200 feet.

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Chapter News

Augusta-Fort Gordon

A discussion of the activities of the United States Army Criminal Investigation Laboratory highlighted the October 15th meeting held at Buck Lodge on Mirror Lake.

The guest speaker, Major Joseph J. Corr of the Provost Marshal General Center Crime Laboratory, stated that the purpose of the USACIL is to assist all law enforcement agencies of the Armed Forces, by means of scientific and technical examination, in the evaluation of physical evidence gathered in connection with the investigation of a crime.

Major Corr was presented the AFCEA participation award by Colonel Robert R. Creighton, chapter president.

Baltimore

A talk on "Communications Satellites in the Space Age" and a tour of the Air Arm Division of Westinghouse Electric Corp. were the featured events at the October 20th dinner meeting.

Brigadier General John C. Monahan, Chief of the Research and Development Division, Office of the Chief Signal Officer, U. S. Army, was the guest speaker.

Many of the current and future military space communications projects "have direct usefulness to the civilian economy and are immediately applicable to commercial communications," General Monahan stated.

Boston

Senior commanders of the Army, Navy and Air Force gathered to discuss the Semi-Automatic Ground Environment (SAGE) air defense system at the September 24th meeting at the Charlestown Naval Officers Club.

The speakers included Maj. Gen. William J. Verbeck, Commander, Thirteenth U. S. Army Corps (Reserve), Fort Devens; Capt. John R. Waters, Boston Naval Shipyard; Col. Wilford H. Tetley, Deputy Commander for Engineering, Air Defense Systems Integration Div., L. G. Hanscom Field, Bedford; Col. Sidney S. Davis, Chairman, Department of Military Science and Tactics, Northeastern University.

Decatur

The value of mathematics in solving business problems and the use of microwaves were topics discussed at two recent meetings of the chapter at the Signal Depot Officers Mess.

R. W. DeSio, Applied Science Manager, Midwestern Region, International Business Machines Corp., presented a film and lecture on "Mathematical Models in Business Problems," September 29. Fred Wiedeman, of the Chicago office of Illinois Bell Telephone Co., spoke on "Microwave Magic," October 27.

Fort Monmouth

A father and son team spoke at the second dinner meeting of the chapter October 15 in the Sapphire Room, Gibbs Hall Officers Club.

Julian Sprague, President of Sprague Electric Co., spoke on production of capacitors and transistors in Russia and included in his talk interesting observations of the Moscow Scientific and Research Enterprises. Peter Sprague, journalist, Yale University, discussed the Hungarian Revolt and showed pictures taken prior to his arrest. Mr. Sprague, who accompanied Vice President Richard Nixon on his Russian trip, also gave his impressions of this trip. Mr. Sprague covered this trip as correspondent for United Press International.

It was announced at the meeting that the chapter is undertaking a drive to gain 250 new members. Presently, the chapter is the third largest in AFCEA.

Gulf Coast

An illustrated talk on "Forward Propagation Tropospheric Scatter" and a discussion of "Operations Enterprise" were presented at the September and October dinner meetings of the chapter.

S-Sgt. Stanley D. Bengston, an instructor in Keesler Technical Training Schools, presented color slides of installations in the Northeast territory showing the unusual high power microwave equipment used in the Forward Propagation Tropospheric Scatter system. The meeting was held at the Airman's Club, Keesler Air Force Base, September 14.

C. C. Walther, New Orleans civic leader, told of his recent interesting around-the-world trip in which he assisted members of industry of other countries in setting up and improving their systems of free enterprise. Mr. Walther made the trip at his own expense as a part of an effort being made by the National Association of Sales Executives to assist other countries and improve international relations. Speaking at the October 5th meeting at Popp's Ferry Restaurant, Mr. Walther also related interesting contacts that he made with industrial leaders in Australia, Egypt, Thailand and Japan.

Hawaii

Krafft A. Ehricke, Consultant, Office of the Secretary of Defense, addressed the September 3rd dinner meeting held at the Fort Shafter Officers Mess, Oahu.

Lexington

"Future Trends in Electronics" was the topic of discussion at the bi-monthly dinner meeting held at the Signal Depot Officers Club, October 16. Approximately 60 members attended.

London

Maj. Gen. Victor A. Conrad, Chief Signal Officer, Supreme Headquarters Allied Powers Europe (SHAPE) discussed "Communications and Electronics with an Allied Command" at the September 24 dinner meeting held at the Columbia Club.

General Conrad explained the structure and composition of the communications and electronics establishment within the North Atlantic Treaty Organization. Using slides to show the complexity of this vast organization, General Conrad described the problems and solutions inherent in NATO and stressed the importance of standardization of techniques, equipment and training as the key to the success of its mission.

Lord Waleran, of E. K. Cole, Ltd., was a special guest of the chapter at the meeting, which was attended by 80 members.

New York

Rear Admiral Frank Virden, Assistant Chief of Naval Operations (Communications), USN and First Vice President of AFCEA, was the kick-off speaker for the New York Chapter's 1959-60 season. The dinner-meeting was held September 30 at the Hotel Belmont Plaza.

Admiral Virden's address was entitled, "The Naval Communication Requirement," and stressed recent developments in our equipment and operating procedures and long range requirements. (See page 14 for the complete address.)

Mr. William H. C. Higgins, Director of Military Electronics Development, Bell Telephone Laboratories, Inc., addressed the October meeting of the chapter. Mr. Higgins, who has been active in the military electronics field since before World War II, discussed "Command Guidance for Ballistic Missiles and Space Vehicles."

Proposed amendments to the Constitution were voted upon at the October meeting and the following nominating committee was appointed to submit a slate for 1960: Chairman, Col. L. R. Engler; Col. J. Z. Millar; Capt. E. C. Powers, USN; and H. R. Bang, ex-officio member.

North Carolina

A dinner-meeting was held in October at the College Inn in Raleigh. Mr. George R. Herbert, President of the Research Triangle Institute in North Carolina was guest speaker for the evening. He discussed the functions of the Institute, its organization and future growth.

The chapter toured the North Carolina State College earlier in the day and were briefed on missile instrumentation and control and the uses of nuclear reactors at the college.

President Bagley, who is leaving for a tour of duty in Korea, turned over the duties of his office to First Vice President Thomas Edwards, Chief Engineer with the Southern Bell Telephone and Telegraph Company. Mr. Edwards will fill the unexpired term as President of the North Carolina Chapter.

Paris

The Executive Committee held a luncheon meeting in September to receive suggestions and to make plans for the chapter's activities during the forthcoming year. The Committee has scheduled three meetings for the year.

Those attending the meeting were: Maj. Gen. C. R. Smith, USA, 1st Vice President; Col. J. L. Debre, Director; Dr. M. J. H. Ponte, Honorary Vice President; Mr. M. Vidrequin, Director; Col. A. H. DeGoede, Director; RAdm. H. C. Bruton, USN, President; Lt. Col. P. H. McCorkle, USA, Secretary-Treasurer; Lt. Gen. J. M. H. Guerin, Honorary Vice President; Col. W. E. Heltzel, USA, Director; Mr. G. Rabuteau, Honorary Vice President.

Philadelphia

Over 100 members and guests of the chapter attended a dinner-meeting at the Hotel Adelphia on October 1.

The chapter was addressed by Col. John M. Herndon, ARDC Directorate of Systems Management and Mr. A. Krieg of AMC Aeronautical Systems Center. The speakers presented illustrated lectures on "Weapons System Management" and "Weapons System Project Office Operation." The complexity of the Weapons System Program from user concept and need for effectuation of the program was explained in some detail with particular attention directed to design, development, production and maintenance stages. The human factors involved were stressed with reference to a need for skilled and strong supporting training programs.

Rocky Mountain

The chapter's September meeting was held at the USAF Academy Officers Club and included installation of new officers and a demonstration lecture by Mr. Cyril N. Hoyler, Manager, Technical Relations, RCA Laboratories, Princeton, N. J.

The lecture, designated "Electronics in Action," included such aspects as electronic photography, astro-electronics, thermo-electronics and a miniaturized television camera.

New officers for 1959-60 are as follows: president, Brig. Gen. F. F. Uhrhane, USA; vice president programs, Mr. H. F. Olds; vice president membership, Mr. L. F. McAdams; vice president publicity, Mr. Alfred Hagedorn; secretary, Maj. C. W. McKelvie; treasurer, Cdr. D. W. Gibb; directors, Mr. A. W. Thompson, Col. R. J. Kuehn, Mr. L. Wilson, Capt. E. H. Green and Lt. Col. J. A. Gahr.

Rome-Utica

Dr. Robert Cornog, a scientist-engineer of the senior staff, Ramo-Wooldridge, division of Thompson Ramo-Wooldridge, Inc., addressed a joint meeting of the Rome-Utica Chapter and the American Rocket Society. Dr. Cornog predicted that impending discoveries in the field of space technology might produce such possibilities in the next century as a one-hour Los Angeles-to-Paris trip, world-wide color TV systems, weather controlled by man and a colony of continuing generations of people born and raised on the moon.

The meeting drew a large number of guests including local science students from area schools.

San Diego

The first fall meeting of the chapter was held September 23 at the Stellardyne Laboratories in El Cajon, California.

Chapter members toured the ultra-modern laboratory which is designed to test and condition electronic, missile and aircraft components. The facilities are coordinated with those of the Central Hadley Company of Pomona and the Oil Fields Company in Canada.

San Francisco

On October 15, the chapter had an open meeting at the Presidio Officers Club, Presidio, San Francisco. The Signal Officer of the 6th Army, Col. H. L. Davis, Jr., was host to 82 members and guests. The guests included visitors from McClellan Air Force Base, Sacramento. After dinner the chapter was treated to a preview of what is being planned in communications for the VIII Winter Olympic Games at Squaw Valley next February. The Department of Defense has assigned to the Department of the Army the responsibility of providing certain support to the Olympic events which is beyond the scope and feasibility for civilian organizations to provide. This responsibility was further delegated to the Commanding General 6th Army.

Lt. Col. L. V. Merle, Jr., representing the Signal Officer, 6th Army, has completed installation of a very extensive communications network in the Valley which will provide telephone and other services in remote areas where commercial facilities are not available. The 41st Signal Battalion furnished installation manpower, and tactical equipment was used.

Col. Merle arranged for Marion Long of Shell Development Co., Emeryville, Cal.; Don Reeves, owner of KAHI Radio Station, Auburn, Cal.; Paul Funkhouser, IBM, San Jose, Cal. and James Tarter, of Pacific Telephone Co., all members of the Olympic Organizing Committee, to speak on their participation in the preparations for this international event. The talks included descriptions of facilities provided by the telephone company, broadcast companies and the Army to accommodate complete radio and television broadcast coverage, as well as installation and usage of a specially designed RAMAC unit for rapidly computing scores for various events. It was also disclosed that Walt Disney will play a major role in making the traditional Olympic pageantry the most spectacular ever.

After the speakers had concluded their talks, a color film entitled "Westward the Flame," narrated by Lowell Thomas was shown. The film was made up of extracts from official "Olympic Winter Game Films" of previous years which took place in Switzerland and Italy. The most thrilling and keenest competitive action high lights were featured and gave a good idea of what can be expected next February at Squaw Valley. There were also some beautiful shots of Squaw Valley showing the new chair lift, artificial ice rink, the men's and women's courses and other features.

San Juan

The chapter held its annual dinner-dance meeting on September 19th.

On October 15, the chapter heard a talk by the District Personnel Officer, Cmdr. Kaine on the Frogmen of the Navy. Prior to his assignment as Personnel Officer, Cmdr. Kaine was Head of U. S. Navy Frogmen for eight years. His talk was accompanied by a film about the Frogmen program and was followed by a question and answer period.

Scott-St. Louis

The October 2nd meeting of the chapter was held at Augustine's Restaurant with 72 members and guests present.

Speaker for the evening was Maj. Cecil J. Brown, USA, Executive Officer, 1st Missile Battalion (Nike-Hercules), 62nd Artillery, U. S. Army Air Defense Command, Scott AFB, Illinois.

Maj. Brown described the organization of the 1st Missile Battalion with its headquarters at Scott Air Force Base and its operational batteries located at Marine, Ill.; Hecker, Ill.; Pere Marquette State Park, Ill., and Pacific Missouri. He defined the mission of the battalion as that of providing air defense for the greater St. Louis area against enemy attack, using the Nike-Hercules surface-to-air supersonic guided missile which is capable of destroying any aircraft or breathing missile known today or foreseeable in the near future. He supplemented his talk with slides and a film, "Nike-Hercules."

South Texas

Colonel George P. Sampson, Chief of the Army Communications Service Division of the Office of the Chief Signal Officer, was the guest speaker at the October 14th meeting at the Fort Sam Houston Officers Club. His talk, entitled "Evaluation of Military Com-

(*Continued on page* 68)

Boston—*On September 24, at the Charlestown Naval Officers Club, Senior Commanders of the Army, Navy and Air Force gathered to discuss the SAGE air defense system at the first fall meeting of the chapter. L to R: Maj. Gen. William J. Verbeck, Commander, 13th U. S. Army Corps (Reserve), Fort Devens; Capt. John R. Waters, Boston Naval Shipyard; Col. Wilford H. Tetley, Deputy Commander for Engineering, Air Defense Systems Integration Division, L. G. Hanscom Field, Bedford, and Col. Sidney S. Davis, Chairman of the Northeastern University Department of Military Science and Tactics and chapter president.*

Hawaii — *Pictured before the September 3rd dinner meeting held at the Fort Shafter Officers Open Mess is Mr. Krafft A. Ehricke, Consultant to the Office of the Secretary of Defense, Washington, D. C., and a leading authority on the space age.*

Lexington—*"Future Trends in Electronics" was the topic of discussion at the chapter's bi-monthly dinner meeting, held October 16th at the Lexington Signal Depot Officers Club. L to R: Ray Soard, chapter president; Elby Martin, Texas Instruments Incorporated, Dallas, Texas, and Colonel Kenneth M. Gonseth, Commander, Lexington Signal Depot, Lexington, Ky.*

London—*The September 24 dinner meeting held at the Columbia Club featured Maj. Gen. Victor A. Conrad as guest speaker and Lord Waleran as special guest. L to R: Lord Waleran, of E. K. Cole, Ltd., special guest; Arthur K. Bradley, Murphy Radio, Ltd.; Maj. Gen. Victor A. Conrad, CSigO SHAPE, guest speaker; Maj. C. L. Bachtel, USA, MAAG-UK, Vice President; Col. A. H. Snider, USAF, Cdr. UK AACS, region vice president and Master of Ceremonies, and Charles R. Houser, Page Communications Engineers, Inc.*

Rocky Mountain—*Pictured are the 1959-60 Officers and Directors of the chapter. Front row, L to R: Lawrence McAdams, vice president, membership; Cdr. D. W. Gibbs, treasurer; Maj. Charles McKelvie, secretary, and Howard F. Olds, vice president, programs. Back row, L to R: Brig. Gen. F. F. Uhrhane, president; Arthur Thompson, director; Louis Wilson, director; Alfred Hagedorn, vice president, publicity, and Capt. E. H. Green, director.*

San Juan—Pictured at the annual dinner-dance meeting on September 19th are, clockwise: Theodore Binder, Consultant to Puerto Rico Telephone Co.; Miss Lobaugh; Edward Ostrehan, Manager, Cable and Wireless, Puerto Rico; Mrs. Kenneth M. Barbier; Clyde Dickey, President, Puerto Rico Telephone Company; Mrs. Ostrehan and Kenneth M. Barbier, President of Radio Corporation of Puerto Rico and last year's chapter president.

Scott-St. Louis — Shown at the October 2nd meeting of the chapter are, L to R: Maj. Cecil J. Brown, USA, Executive Officer, 1st Missile Battalion (Nike-Hercules), 62nd Artillery, U. S. Army Air Defense Command, Scott AFB, Ill., and Col. George A. Zahn, USAF, chapter president.

Chapter News (*Cont'd. from p. 66*)

munications," drew a historic parallel of communications to weapons systems and present status of communications in relation to weapons systems.

Southern California

A joint meeting of the Southern California chapter and the Western Electronic Manufacturers Association was held at the Statler Hotel on September 9. This opening meeting of the year featured J. Lewis Powell from the Office of the Assistant Secretary of Defense for Logistics who spoke on "The Collapse of Time."

Seattle

At the September 29 luncheon held at the Benjamin Franklin Hotel, Seattle, Wash., John W. Inwood, District Manager of Western Union, Los Angeles, President of the Southern California Chapter, and 4th Vice President of AFCEA was introduced. The purpose of his visit was to inform the chapter of the philosophy and methods used in the development of the Southern California Chapter. Mr. Inwood presented a very interesting history of his Chapter and he offered helpful suggestions to utilize the great potential he feels is present in the Seattle Chapter.

On October 14, the chapter held a dinner meeting at the Benjamin Franklin Hotel, Seattle, Wash., which was called to order by President Larkin.

Russ Winslow, Engineering Supervisor, preliminary design, Boeing Airplane Co., was introduced. He gave a very thorough account of his visit to the 1959 AFCEA National Convention in Washington, D. C. Mr. Winslow, a veteran convention-goer, gave high praise to the AFCEA convention planners for the fine layout and dynamic operational type of exhibits, the well run field trips and the effective social functions. The speaker felt that this convention was the "best by far" he had ever attended.

Tinker-Oklahoma City

The first meeting of the chapter for the 1959-60 year was held at the Tinker Air Force Base Officers Mess, on September 17th. Announcement of Committees was made by Vice President Bob Davis in the absence of President Timme, with Larry Trautman, named as Program Chairman and Maj. James Rogers as Membership Chairman. Carl Atkinson, the first (1954) Chapter President of the chapter was introduced to the group.

The program for the meeting, titled "Transistor Technological Training." was presented by James Adams of the Technical Representative Division, Philco Corporation. Mr. Adams covered in his lecture recent developments in the design and utilization of transistors in Commercial and Military application. He further illustrated, by use of the Philco Trainer, the versatility of the transistor with basic electronic units.

Washington

Capt. H. G. Munson, USN, Hydrographer of the Navy, addressed the Chapter's monthly meeting at the Willard Hotel, in Washington, D. C. on October 1. Capt. Munson stated that most of the equipment for scientific ocean exploration is cumbersome, slow to operate, archaic and inaccurate. He challenged industry to solve these problems which he termed comparable to those in the space field but of more immediate importance. He further stated that he would buy, regardless of the cost, any such instruments developed that would do the job.

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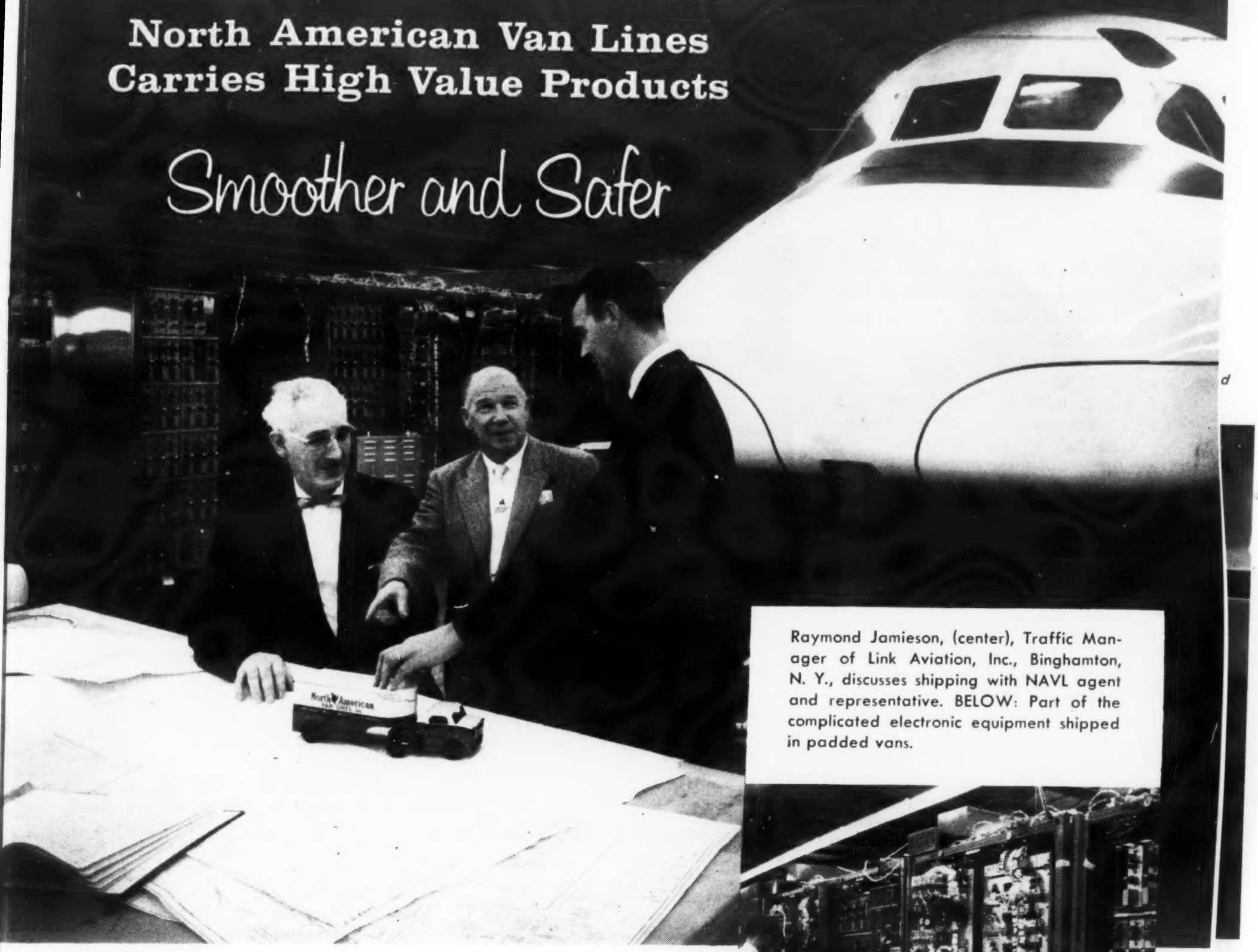
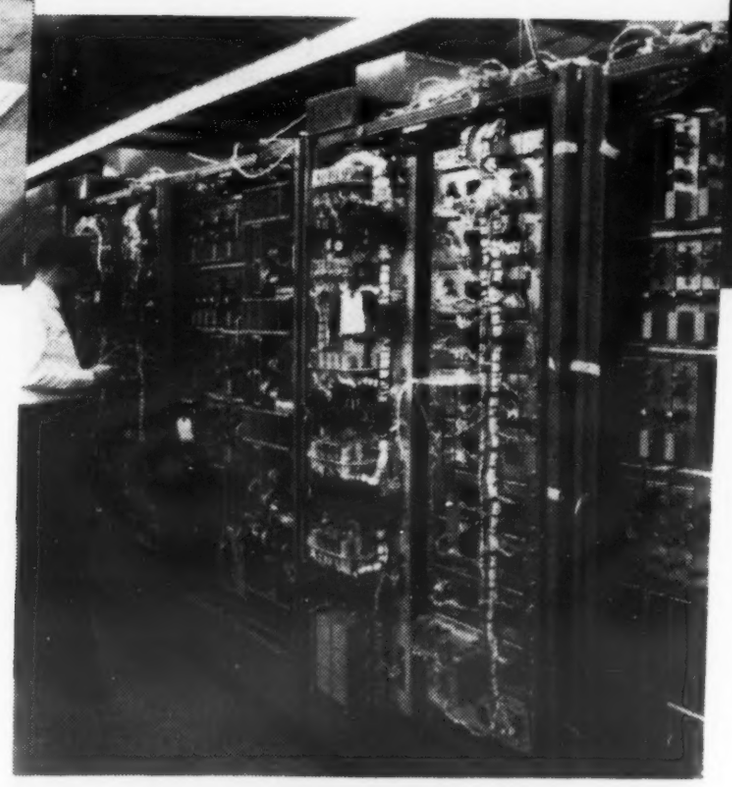


Raymond Jamieson, (center), Traffic Manager of Link Aviation, Inc., Binghamton, N. Y., discusses shipping with NAVL agent and representative. BELOW: Part of the complicated electronic equipment shipped in padded vans.



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NEWS ITEMS AND NEW PRODUCTS

An infrared sensing device that electronically detects over-heated railroad car journal boxes was shown in the United States for the first time by Link Aviation, Inc., Binghampton, N.Y. The detector, developed by Siemens-Halske of Brunswick, West Germany, was introduced before the Signal Section Convention of the Association of American Railroads held in October at the Statler Hilton Hotel, Washington. D. C. The detector, which has been in use in Europe for the past three years, will be manufactured and distributed in the U. S. by Link under a licensing agreement.

Link believes this equipment will result in tremendous monetary savings for American railway companies by preventing accidents caused by overheated journal boxes. According to the company, 157,000 accidents resulting from hot boxes, occurred in this country last year. These accidents caused a loss of $9 million to the companies through claims for damage to rolling stock. This does not include costs of damage to roadbeds and trains.

By means of temperature sensing and a comparison mechanism the equipment accurately distinguishes an overheated box from journal boxes operating at acceptable temperatures. Each detector site will have a sensor on both sides of the track. High temperature indications are converted to an electrical signal, which can be transmitted over existing signal or communication channels to the remotely located readout equipment. The readout equipment will give a hot box alarm both audibly and visually. It will display the axle location and side of train of the detected hot box.

The temperature measuring concept upon which the equipment design is based enables it to operate fully automatically, removing the need for operator judgment or attention. Climatic temperature fluctuations and other variables influencing the ambient of normally functioning journal boxes, are automatically compensated for without requiring reduction of detector sensitivity. The equipment requires fewer components and is smaller in size than existing U.S. hot box detection systems.

Other advantages of this type system are: speed of operation—the system provides hot box indication at

David Mason, (left) president of Link Aviation, Inc., demonstrates a new hot box detector for W. J. Baird, Editor of SIGNAL, at the annual meeting of the Signal Section Convention of the Association of American Railroads.

train speeds of 0 to 60 mph; sensitivity—it can reliably detect any journal box temperature which is only 10° hotter than other normally operating journal boxes; timing—timing is constant with no variable degree of exposure; bi-directional—the system operates regardless of which way the train moves on the track.

The estimated cost for the unit is $10,000.

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The Navy has turned to electronic data processing to keep track of its weapons and ammunition in shore bases and ships located around the world.

An RCA 501 computer, devised by the Bureau of Ordnance and developed by Radio Corporation of America, will become a chief logistics aid to the newly established Bureau of Naval Weapons which will take over the responsibilities of the Bureaus of Ordnance and Aeronautics in January.

The system will provide world-wide daily inventory, production and quality control of all Navy weapons, from the time they start through the production line until they are expended in training exercise or actual warfare. Eventually the system will be employed for over-all logistics control on non-expendable items—such as guns, gun mounts and missile launchers—as well as for financial management, quality evaluation and research project management.

The memory box of the RCA 501 will become one of the Navy's most carefully guarded files. It will contain not only all weapons and ammunition production schedules and inventory position, but will know where which fleet, or any single ship in the fleet, will be at any given time. This will be necessary to keep ammunition pipelines filled at all times from factory to ship deck or missile base.

Rear Admiral Miles H. Hubbard, Chief of the Bureau of Ordnance, commenting on the data-processing program, said: "Many months of planning and thousands of man-hours of work were devoted in the development of the best possible system to solve extremely complex problems of management. Following this study, a data processing branch was established in the BuOrd. This branch began coordinating data processing systems to ensure that whenever possible individual methods of record keeping could be integrated into one unit system, providing all the required data for our day-to-day, as well as future mobilization needs."

Rear Admiral Paul D. Stroop, Chief of the Bureau of Naval Weapons, said that this equipment, to be inherited from the Bureau of Ordnance, would "greatly increase the efficiency of over-all operations in the new Bureau of Naval Weapons which will be the largest single organization in the Department of the Navy."

The RCA 501 is designed on the "building-block" concept to permit easy future expansion. The system employs a common main electronic circuit that permits gradual expansion without replacement of original equipment or change in programming approach. The system employs transistors throughout all companion equipment as well as the computer itself. A room 25 x 30 feet can accomodate a basic 501 unit.

• • •

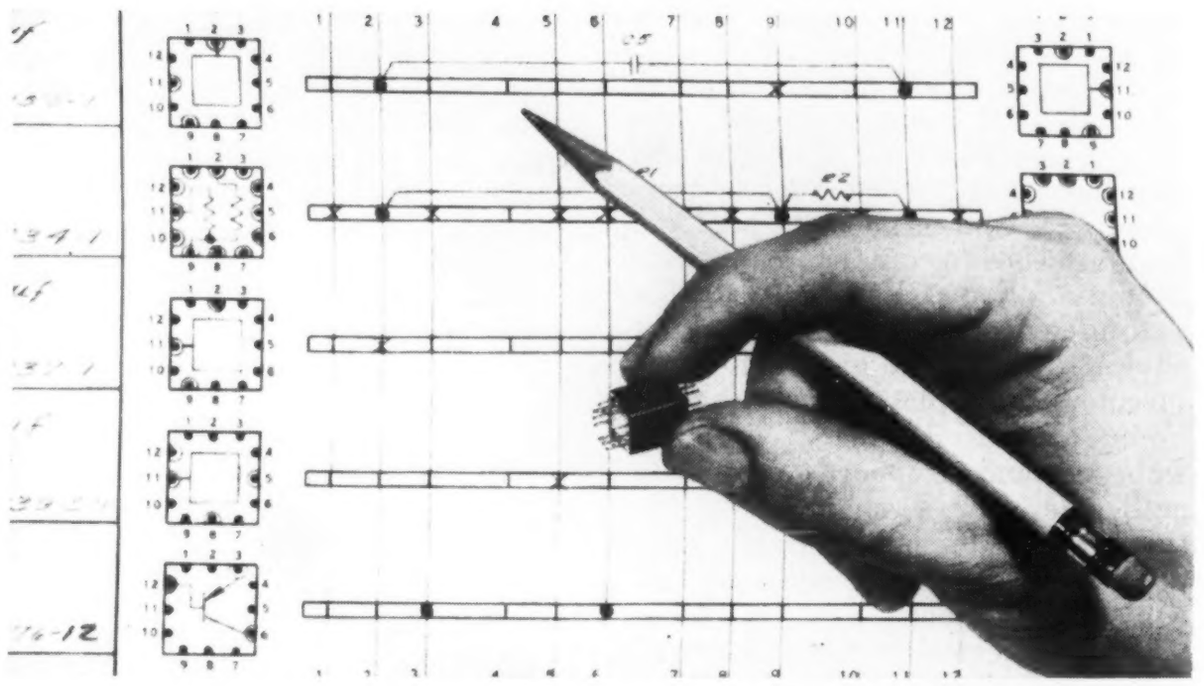
"**Physical and Engineering Properties of Materials for Nuclear Fuel Elements**" presents data of interest to those engaged in the design, fabrication and use of nuclear fuel and control elements.

Eighty tables are presented in the publication. The first contains ther-

Status Report on RCA Micromodules—
dramatic new devices for high-density parts packaging

How soon will you see your electronic products in Micromodule form?

The excitement over Micromodules is still mounting! We haven't seen such enthusiasm and activity since the early days of transistors. Scores of electronic equipment designers and manufacturers are asking: "How soon can I see my product in Micromodule form?" Our answer: *Right Now!* We'll take your circuit, breadboard, or black box, evaluate it and convert it to module form. In fact, you will find that end-equipment in Micromodule form is probably only *one design cycle away!*



RCA Micromodules, todays' most exciting, most practical answer to high-density parts packaging, make possible equipment with modular parts densities to 600,000 per cubic foot. Result: important space savings over existing miniature equipment and an amazing increase in the *number of circuit functions* per cubic foot. Increased reliability through redundancy, room for more circuits to improve accuracy, precision, control and sensitivity are other significant advantages offered to designers.

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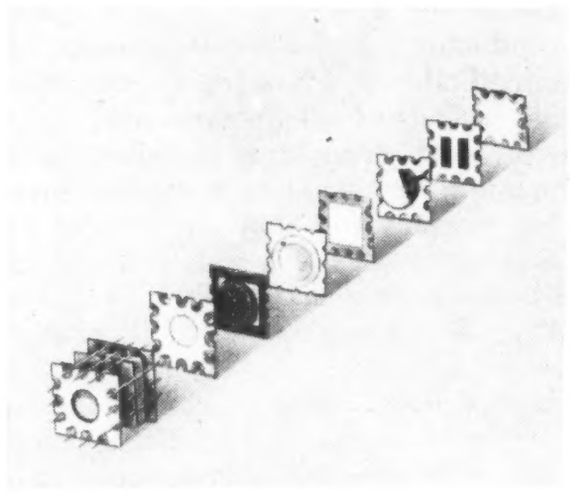
RCA Field Engineers are prepared to show you a presentation that will clearly explain the potentialities and the current working realities of Micromodules for application in military computers, digital devices for missiles and satellites, airborne or portable communication equipment, or submarine electronics. Many designers who have seen this presentation were so impressed with the possibilities of extreme miniaturization and increased reliability of Micromodules that they have immediately placed orders to begin micromodularization of their equipment. Call your RCA Field Representative today and he will set up a presentation for you at your convenience.



Micromodules, developed through the joint efforts of RCA and other leading component manufacturers, in cooperation with the U.S. Army Signal Corps, are units in which several microelements are combined to perform specific functions such as amplifier, oscillator, or divider. The microelements are tiny ceramic wafers .310 inches square and 1/100th inch thick, on which conducting, semiconducting, and insulating materials are fused to provide the electrical characteristics of basic electronic components such as resistors, capacitors, and transistors. The microelements are interconnected and encapsulated to form Micromodules.

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The booklet is available for $1.00 per copy from Sylvania-Corning Nuclear Corporation, Bayside, Long Island, New York.

• • •

Air Materiel Command, Wright-Patterson Air Force Base, Ohio, has announced the publication of an additional 104 descriptions of items for the Technical Information File of ground support equipment.

Published as a looseleaf document, the descriptions are mainly of items with a minimum cost of $2,000 and supplement 447 descriptions of technical and engineering data prepared and furnished to contractors last June by the Air Force. Purpose of the file is to present items of ground support equipment which are in the Air Force inventory, or in development for Air Force use, to designers concerned with ground support equipment needed for new weapon systems. In this way, AMC hopes to eliminate duplication of developments of new equipment. Contractors furnished with this information file will be able to pick out needed support items that will suffice for the new weapon system in which they are involved.

According to Colonel C. N. Howze, who heads AMC's Cataloging and Standardization Division, "We have had full cooperation of industry in establishing this file. We have worked with Aerospace Industries Association, National Security Industrial Association, Electronic Industries Association and the Society of Automotive Engineers. They have contributed fully of their time and excellent abilities to help in this project. Now it is up to the contractors to make full use of the product, for the mutual benefit of the Air Force, industry and the taxpayers."

• • •

The 1959 Registry of Public Safety Radio Systems lists systems operated by municipal, county, state, zone and interzone police, fire departments, highway departments, forestry conservation and special emergency organizations. The publication also includes listings for the new local government service.

Part I lists the systems by names of the licensees, showing the addresses of the control points, frequencies, call letters, number of mobile units authorized and make of equipment used. Part 2 lists the stations by operating frequencies.

Copies of the publication are available at $4.00 per copy from Communication Engineering Book Co., Radio Hill, Monterey, Massachusetts.

• • •

The Third International Conference on Medical Electronics to be held in London has been scheduled for July 1960.

The Conference, sponsored by the Electronics and Communications Section of the Institution of Electrical Engineers in association with the International Federation for Medical Electronics, will bring together members of the medical and electrical engineering profession. General sessions are planned to enable medical practitioners and electrical engineers to increase their background knowledge in the field of medical electronics. Specialist sessions will be held for those engaged in medical electronics work enabling them to present papers on the latest developments and to discuss particular problems in greater detail.

Organization of an International Scientific Exhibition on Medical Electronics in conjunction with the Conference is also included in present plans.

• • •

Frank A. Halden and his co-workers in the Ceremics Technology Group of the Stanford Research Institute have developed a new process for the preparation of a high temperature semiconductor. The process consists of a method to produce high-purity, single crystals of silicon carbide.

Present transistors employ germanium or silicon as a semiconducting element and they are limited to maximum operating temperatures of approximately 190 to 450° Fahrenheit. Temperatures beyond this range cause the transistors to conduct by heat energy. Silicon carbide when produced as single, high-purity crystals, promises to operate at much higher temperatures—up to around 1800°F.

Silicon and germanium crystals are usually grown by slow crystalization of the melted compound onto a seed crystal. Silicon carbide, however, does not melt at ordinary pressures but vaporizes and decomposes instead. A solution to the problem was suggested about two years ago by Nobel laureate William Shockley when he proposed that silicon carbide crystals might be grown from solution in alloy melts.

Using this idea, Halden put the theory into practice. His work was done under initial subcontract from the Shockley Transistor Corp. who, in turn, was contracted by the Bureau of Ships. Using a modification of a standard crystal-pulling furnace, he melts pure silicon in a carbon receptacle. The carbon of the crucible diffuses into molten silicon and saturates the solution. A "cool spot" is then produced in one area of the solution by careful temperature control. The result is a localized area of supersaturated solution from which silicon carbide crystals can be grown.

The crystals produced so far are too small to be commercially usable. However, the process appears sufficiently promising that the Electronic Warfare and Parts Branch of the Bureau of Ships has contracted for funds to extend the work another year.

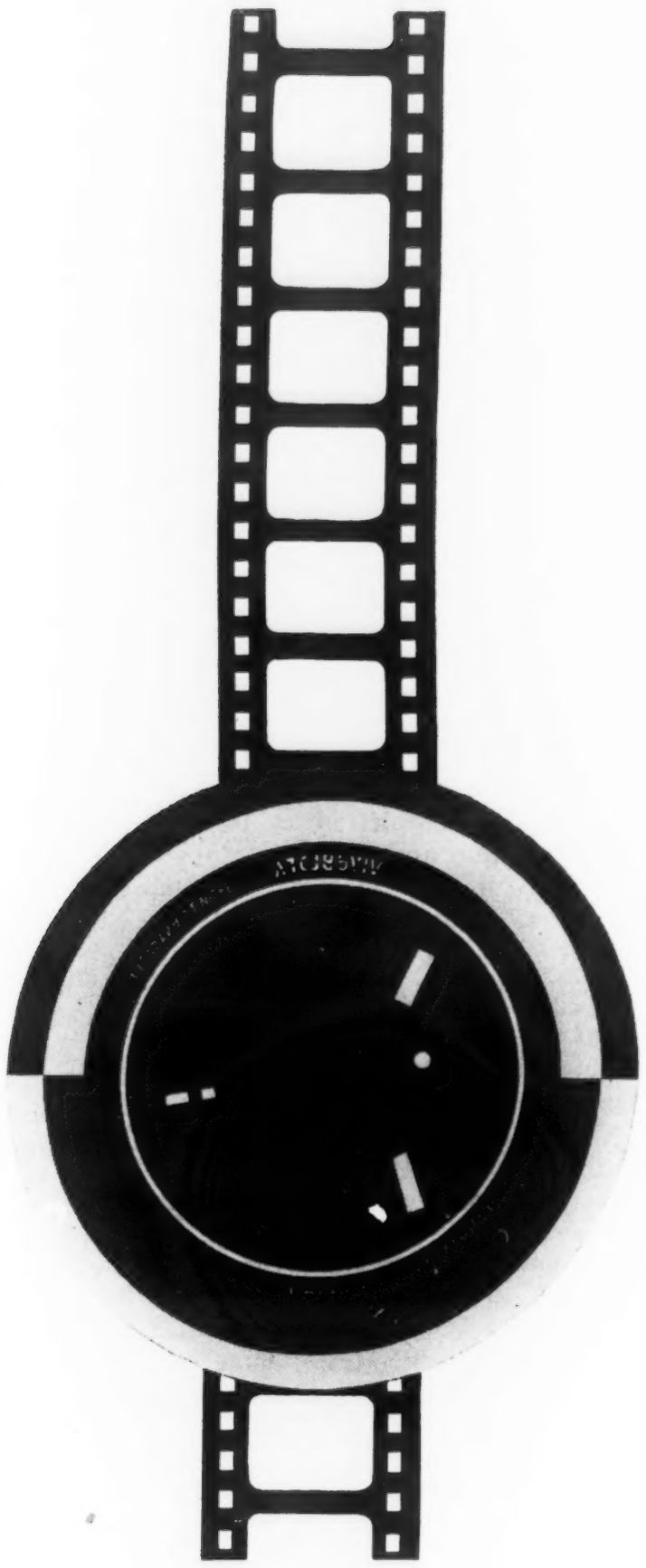
When perfected, the new crystals should open a whole new field of uses for semiconductors. For example, they may be applicable not only in situations where the environment itself is hot, such as in missiles, but also in complex electronic equipment or other devices where the extremely small size of the components creates a problem of heat dissipation.

• • •

A radio-teleprinter for special use on radio circuits where interference is likely to be encountered has been designed by the Electronics Division of the Ateliers De Constructions Electriques De Charleroi, Charleroi, Belgium.

The instrument which provides protection against signal distortion, interference, slow, rapid and selective fading, may be connected to any type of radio telephone transmitter or receiver. Each letter, sign or movement is transmitted by means of two consecutive audio frequency alternating currents. Twelve basic frequencies between 406 and 586 cycles are employed which are divided into two separate groups: the first of eight and the second of four frequencies. As each frequency of the first group may be followed by any one of the frequencies of the second group, 32 different combinations are obtained.

Each of the twelve alternating currents is generated by an electromagnetic oscillator of the vibrating reed type, two of these oscillators being selected by the keyboard for the transmission of each letter. The output voltages of the oscillators are fed



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through an amplifier which provides an output power adjustable from zero to 3 mw into a 600 ohm line.

The signal arriving at the receiving machine is amplified to a level sufficient to operate the selector mechanism which comprises twelve reeds, free to vibrate in the field of an electromagnet. Each reed is tuned to a frequency corresponding to that of one of the transmission oscillators. These selector reeds are fitted with contacts which are connected in a well defined order to the grids of five thyratrons. The anode circuit of each thyratron contains a selection electromagnet which controls one of the code bars of a printing mechanism similar to that of a five-nut teleprinter. The use of only two signals in place of the seven of the five unit system enables the length of each elementary signal to be increased to 75 milliseconds. As the selectors are adjusted to operate after a signal duration of 30 milliseconds, the safety margin is therefore 45 milliseconds with the result that interference pulses of any amplitude do not introduce any error into the received text provided that their duration does not exceed 30 milliseconds. This applies to rapid fading.

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MARS SSB Net has scheduled the following speakers for January:

January 6: "The ATOMICHRON," by Philip Heath, Manager, Field Service Engineering Department, National Co., Inc.

January 13: "Antenna Multi-Coupler," by Carl G. Southeimer, Executive Vice President, CGS Laboratories.

January 20: "Television and the Amateur Operator," by Gregory G. Lentzakis, Chief Instructor TV Course, Radio Division, USASCS, Fort Monmouth.

January 27: "Basics and Applications of Re-enforced Plastics in Communications Products," by Walter H. Greenberg, Director of Research and J. Harvey McCoy, Staff Engineer, Riverside Plastics Corporation.

The First U. S. Army MARS SSB Technical Net can be heard each Wednesday evening at 9:00 P.M. EST on 4030 kc upper sideband.

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A second large-scale electronic data acquisition system is being constructed by the Beltsville, Md. division of Minneapolis-Honeywell Regulator Company for use in high-speed processing of rocket engine tests information.

The system will be installed at the Bacchus, Utah rocket propellant plant at Hercules Powder Company, which is developing a third-stage engine for the solid-fuel Air Force ICBM, Minuteman.

The system will monitor and record at high-speed such variables as temperature, pressure, force, strain and vibration during static firing of solid fuel rocket motors and process this data for analysis by computers and other devices. The system will include two transistorized digital data recorder-transcribers, six magnetic tape recorder-reproducers, three direct-writing oscillographs, a wave analyzer, a tape loop transport, and a control console.

As many as 120 measurements of variables can be made simultaneously, the company said. Each of the digital data recorder-transcribers can handle as many as 10,000 items of test data per second.

Another data acquisition system is nearing completion at the Beltsville division and will be installed in the Navy-owned Allegheny Ballistics Laboratory at Pinto, W. Virginia.

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The United States Patent Office has published a new information pamphlet designated *Patents and Inventions—An Information Aid for Inventors.* The pamphlet contains basic information as to patenting and patent procedures, and related information which may prove helpful in the development and marketing of inventions.

Copies are available through the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C., at a price of 15 cents per copy—$11.25 per 100 copies in larger lots—and the Department of Commerce Field Service Offices in cities where such offices exist.

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A 4-page folder, containing technical information on the X-ray diffraction method used for tracing fire sources, is available from the Instruments Division, Philips Electronics, Inc., 750 South Fulton Avenue, Mount Vernon, N.Y.

Illustrated with twelve diffraction films covering copper and aluminum conductors, the bulletin illustrates how X-ray patterns differentiate between identical wires which have endured various heat conditions.

• • •

The Comptometer Corporation of Chicago, Ill., is manufacturing instruments designated Electrowriter Communication Systems.

The Electrowriter instruments are designed to transmit graphic intelligence, such as handwriting or sketching, over any standard telephone circuit of reasonable quality, regardless of distance. The transmission will pass through either military or commercial telephone systems, both manual or dial, and is also applicable on appropriate radio circuits.

The Model 88-T Transmitter transmits messages by writing them on paper by means of a ball point pen which is permanently attached. The Model 88-R Receiver uses a capillary type pen to record the intelligence with ink. Untreated paper is used and is available plain or with form printing, in rolls or fanfolded. For special scientific or military applications where the use of ink may be impractical, treated paper and dry stylus can be made available. In the Model 88-C Transceiver, where the same pen arm is used for transmitting and receiving, a magnetized stylus is attached to the pen when transmitting. This stylus is detached and returned to its holder after each transmission. The Model 88 equipment is transistorized and self-contained. It can be supplied with either a friction paper feed roll or one equipped with sprocket pins, which permits the use of printed forms.

The company believes the instruments will have application in Field Army use, shipboard use, inter-office communication, communications between various headquarters and commands and virtually any other situation where telephone communication is presently employed.

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Sound and Vision as a Tool was the theme of the 1959 Industrial Film and Audio-Visual Exhibition in which AFCEA and some 80 manufacturers and service organizations in the audio-visual field from all parts of the country participated. Commercial exhibits extended over 30,000 square feet of space on two floors at the New York Trade Show Building. They covered the full range of audio-visual aids and accessories now in increasingly wide use in business and industry, in education, religious instruction, civic and welfare training programs, as well as in medical and health work of various kinds.

Increases of as much as 35% in the 1959 sales volume in their already booming $250,000,000 audio-visual equipment and services industry were predicted by exhibitors at this show. Herbert Rosen, President of Industrial Exhibitions, Inc., reported, "Great optimism for business prospects for the remainder of the year and for next prevails throughout the industry. Our exhibitors now

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realize, and are gearing their production plans accordingly, that merchandising experts, training directors in industry, leaders in education and in religious and social welfare agencies generally are only beginning to appreciate and to utilize the effectiveness and economy possible in their various activities through the use of new audio-visual tools and accessories."

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A magnetic pinch plasma engine conceived for propelling interplanetary space ships is seen as having "a far more immediate purpose" in controlling satellites.

Alfred Kunen, manager of the plasma propulsion project at Republic Aviation Corp., Farmingdale, L.I., reports the low fueled engine could be used to power satellites after they have attained orbit.

With a low-powered engine to take over in orbit, a satellite could prevent tumbling over itself, which inteferes with its ability to send and receive messages and to take pictures. Also, the vehicle could stay in orbit longer by overcoming the dragging force by particles encountered in outer space. Such particles slow satellites and bring them down into the Earth's gravitational pull. The engine would also allow a satellite to change its own orbit and thus compensate for inaccuracies in the original firing or to move subsequently to a different latitude for reconnaissance purposes.

The engine uses a hot gas for fuel and turns it into a plasma—a fourth state of matter evolving from gases in which the molecules are broken into electrons and positive ions.

An electrical current is shot into the engine's compression chamber. This current reacts on the hot gas fuel, causing it to change into a plasma state. The current of electricity then passes around the electrically conductive plasma, setting up a cylindrical magnetic field. This magnetic cylinder pinches the plasma into a tiny area so designed that it shoots out the rear at very high velocities. According to the company, the first experimental engine generated an estimated thrust of 8,000 pounds for a period of one microsecond.

For interplanetary propulsion, the plasma engine would be the power unit of a space ship after it had attained orbit around the Earth. It would then propel the craft out of orbit into an interplanetary flight path, operating only intermittently to keep the ship on its proper path.

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The National Bureau of Standards has designed and built a compact apparatus for generating high pressures to make possible determinations of the properties of materials at high temperatures. The objectives are to establish fixed points on the pressure scale and to devise improved pressure measurement techniques.

Designed by E. C. Lloyd, U. C. Hutton, and D. P. Johnson, the apparatus produces pressures of 100,000 atm and above by the application of force against each face of a ½ inch regular tetrahedron of pyrophyllite (hydrous aluminum silicate).

Other devices for a similar purpose have been made with 4 independent hydraulic rams to apply forces to the faces of a tetrahydron. The Bureau design, however, consists of an assembly in which external force is applied to only 1 of 4 anvils, with wedge reaction forces acting on the remaining 3 anvils. Because only one external force is needed to operate it. the apparatus can be used in a conventional hydraulic press. The apparatus has a diameter of only eight inches at its lower bolster.

While a specimen is under high pressure, 4 electrical connections through the anvils permit resistance heating of the specimen and measurement of its temperature and electrical resistance. Other advantages of the apparatus are easy manipulation and alignment of the anvils, and rapid assembly and disassembly.

When the apparatus is used to study resistance changes with pressure a specimen is first inserted in a hole drilled from edge to edge of the tetrahedron. Pieces of silver foil are placed in contact with each end of the specimen and bent to give an exposed surface to each of the anvil faces. Thus, one end of each foil is in position to make electrical contact with one anvil. The remaining notches in the edges of the tetrahedron are then filled with prisms of pyrophillite and the tetrahedral assembly is ready for an experiment. This arrangement makes available an electrical lead via each of the 4 anvils. Thus, a 4-lead circuit can be used for resistance measurements during studies of changes in electrical resistance with increasing pressure.

Measurements of relative resistance with pressure have been made with specimens of antimony, barium and bismuth. The results have shown good agreement with the work of other investigators. Values of ram forces required to reach the first resistance transitions of barium and bismuth have indicated that approximately 10% of the total applied force is lost to gasket forces and to the internal friction of pyrophyllite.

It is hoped that further work will enable the National Bureau of Standards to determine more accurately the pressures at which there are changes in electrical resistance, changes of state, and polymorphic crystalline transitions in certain materials. The properties of these materials could then be used to define fixed pressure points useful in pressure calibrations, in much the same way that freezing points of certain materials are used to define the International Temperature Scale.

• • •

An antenna test range extending more than 3000 feet between receiver and transmitter location, recently was put into operation by the Technical Appliance Corporation, (TACO) of Sherburne, New York. The new facility is located on two hills, approximately 300 feet in elevation above a valley separating the hills. Test transmissions across the valley are electronically clean, showing a minimum of reflected, or delayed signals.

Transmitting, receiving and measuring equipment is available for all frequencies from VHF up through X-band region. Facilities at the site include a blockhouse at the trans-

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mitter for housing the electronic equipment, test antenna towers at both the transmitter and receiver sites, and a large field laboratory adjacent to the receiving site. The field laboratory houses complete measuring facilities, as well as engineering field offices and conference rooms.

Mechanical facilities at the receiving station permit complete field performance tests of antennas ranging in size to 60 feet in diameter with present test equipment. Larger sizes can be accommodated through modification and extension of present equipment.

• • •

Miniaturization through employment of solid state design, miniaturized components and repacking techniques has resulted in two new special purpose receivers, Types 1905 and 1906.

Developed by the Nems-Clarke Company, a division of Vitro Corporation of America, the receivers are less than half the size of standard rack mounting with panels 19 inches wide by 3½ inches high by a maximum of 15 inches deep. The company also states a weight reduction of approximately 50% is realized. The receivers have a frequency range coverage of 30 to 260 megacycles. Two bands are employed; one of 30 to 60 megacycles and the other from 60 to 260 megacycles. Type 1905 reception is AM and CW and Type 1906 reception is FM, AM and CW.

• • •

A new, self-powered transistor checker is being manufactured by Seco Manufacturing Company of Minneapolis, Minnesota.

The portable Seco Model 100 tests a wide range of transistor types including: small signal; "drift" types; medium power types; and power types. The unit provides a quick, positive check for "opens," shorts and gain, and in addition, automatically identifies and checks PNP and NPN models. The company reports that only one test needs to be made—the GO/NO GO test. If desired, the control knob can be varied, then by noting the dial reading on gain merit, similar transistor types can be effectively matched. Transistors under test are plugged into the unit, or clipped into the circuit with alligator clips mounted to self-storing external leads. Visual indication of the output signal is the end result of dynamic current gain in an operating circuit. The existing dynamic distribution of leakage is automatically taken into consideration by the unit when testing and further leakage tests are unnecessary. The unit utilizes collector currents from 5 ma. on small transistors to 50 ma. or more, on power types. The unit is also equipped with jacks to permit the use of an ACVM, scope, or audio/visual amplifier as output indicators for making sensitive noise tests; studying dynamic leakage distribution, or waveform inspection.

• • •

The creation of information scientists or information researchers on the same corporate levels as technical scientists and researchers has been proposed by John C. Green, Director of the Office of Technical Services, U. S. Department of Commerce.

Addressing the 15th Annual National Electronics Conference meeting in the Hotel Sherman, Chicago, Mr. Green explained these information scientists would have central responsibility for seeing that all information from all sources promptly reaches the people who could use it.

Speaking on "Technical Information—A World-Wide Explosion," he pointed out that the Russians are producing abstracts of technical articles from around the world within four to seven months. Although we are keeping pace, Mr. Green pointed out that American industry is not yet "mining its information resources" effectively.

Mr. Green suggests more license arrangements that would permit several companies, large and small, to pool their research findings. Secondly, he suggests more thorough use of reports being issued by Federal Government Agencies. Mr. Green pointed out that 1000 such reports are issued monthly and these could represent a tangible return of tax dollars to anyone who would use them.

• • •

A dual-beam oscilloscope, developed by Allen B. DuMont Laboratories, Inc., Clifton, N. J., employs a multi-gun cathode-ray tube rather than an electronic switch or beam splitting.

The DuMont 411 oscilloscope is capable of displaying X-Y plots and simultaneously displaying the X or Y signal against time. Because the calibrated sweep is generated at a high level, it can be fed directly into the horizontal deflection plates without amplification. It is therefore possible to use one gun of the dual-beam cathode-ray tube as a single beam oscilloscope having identical amplifiers, each amplifier having one millivolt full-scale sensitivity, while either the X or Y input of this display can be simultaneously presented against time on the other channel.

A switching arrangement on the front panel develops nine major modes of display, and, by introducing Z-axis modulation, 27 additional display modes are possible.

Photoprogress

Lunik III has transmitted photographs of the Moon to Earth via television over distances of up to 290,000 miles. Among the pictures were shots of the hidden side of the Moon which revealed far fewer landmarks than exist on the face seen from Earth.

The Soviet news agency, TASS, in an official announcement, said photographic apparatus aboard the rocket was switched on at 6:30 a.m. Moscow time, October 7, and took pictures for 40 minutes. At the time, the satellite was from 37,300 to 43,500 miles from the Moon. Processing of the films, developing and fixing, was all done automatically on board the satellite upon radio signal from Earth.

According to *Pravda*, the Russian Communist Party newspaper, the photographs were taken on special 35 millimeter film through 2 lenses of 200 and 500 millimeter focal length. One lens provided an over-all picture of the Moon, and the other gave a more detailed image.

It is understood the United States, in its planned Moon shot, will use an electronic scanning device to send back signals from which a picture can be reconstructed.

• • •

A new way to pinpoint all terrain features reflecting the same amount of radar radiation was described before the annual convention of the Society of Photographic Scientists and Engineers (SPSE) by Frank Scott of the Goodyear Aircraft Corp., Akron, Ohio. Speaking in Chicago, Scott told of a new photo-interpretation tool called image-density isolation.

The technique allows scientists to select and emphasize all areas in a photograph having a single density or "grayness." Areas having exactly the same shade of gray might represent such things as a single rocket-flame temperature or a certain terrain feature on a radar screen, Scott said.

Scientists often use a densitometer to determine the gray-level in a particular area of a photograph, he explained. But the sensitometer can measure only a relatively small picture area. To find the position of a

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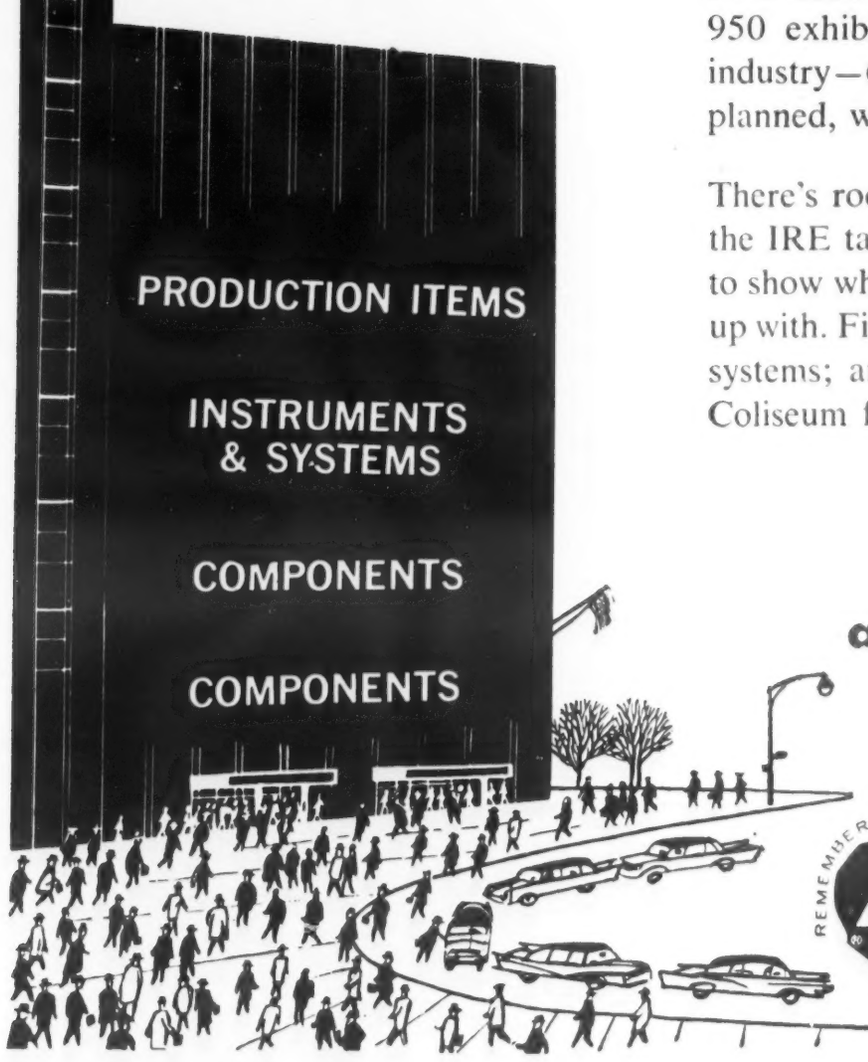

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single gray-level throughout the picture requires numerous time-consuming readings. The new method gives a picture in which predetermined shades of gray, corresponding to specified light or energy levels in the original photograph, are emphasized so they are visible to the naked eye. Only part of the original picture containing the density areas in which researchers are interested shows up on the print finally used for evaluation, Scott said.

• • •

Dr. Harold E. Edgerton and Frederick E. Barstow of Edgerton, Germeshausen and Grier, Inc., presented a paper on multiflash photography before the SPSE convention.

The paper outlined modern methods for recording the path of a bullet or the explosion of a dynamite cap in successive exposures on a single piece of film.

In photographing a bullet in flight, the bullet triggers an electronic circuit when it passes a certain point in its path, Dr. Edgerton said. The circuit pulses a flash unit, perhaps once every 1/100,000 of a second, as the bullet passes the camera lens. Each flash gives a separate picture of the speeding bullet on a single piece of film, the scientist explained. By correct focusing and subject lighting, the shock waves produced by the bullet can also be photographed.

The researchers also discussed equipment and special electronic circuits for pulsing the light flashes and controlling flash duration.

• • •

Two Kodak scientists, who have been doing research in an area known to the microscope experts as "the object space," have written a paper on their findings which will be published in *The Journal of the Royal Microscopical Society*.

Roger P. Loveland and Bernard M. Spinell, Kodak Research Laboratories, concentrated on the optics involving the small space where specimens are placed in order to be viewed through a microscope. The scientists studied the effect of varied thickness in cover glasses on the microscope image. They checked changes in refraction or light-bending that come with variations of refractive index and temperature of the oil used with certain microscope lenses. Finally, they set up guiding measurements to help microscopists gauge with new accuracy the effect of such components on what they see through their instruments.

Microscope definition is often a limiting factor in certain types of research. The Kodak paper is expected to be useful to researchers trying to obtain the best possible definition from their microscopes.

• • •

Two new photographic films of particular interest to photoengravers were introduced by the Du Pont Photo Products Department at the American Photoengravers Association Convention held in Dallas last October.

"Cronar" Ortho M has an extremely high contrast, wide latitude orthochromatic emulsion on .004 polyester base. It has an emulsion and backing surface treatment that minimizes contact printing problems caused by Newton's rings and trapped air bells. The film also reduces vacuum drawdown time by a factor of three and prevents film from sticking together when tray-processing multiple sheets. The all-purpose film can be used to advantage in making large-size contacts; exposing pre-sensitized lithographic plates; in exposing smooth-surfaced photo engraving plates; in printing critical contact half-tones; in making flat tints by contact; in making high-light masks, and in phototypography.

"Cronar" Clear Back Ortho film, also on .004 polyester base, is a high contrast, orthochromatic film with a low-density, antihalation coating designed to permit exposure through the film base, thus providing lateral reversal of image directly in the camera. Like Ortho M, Clear Back film has a special surface treatment which virtually eliminates common contact problems and prevents film sticking together. When exposed on emulsion side, it has the same speed as standard high contrast film. When exposed through the base, it requires an exposure increase of only 10 to 30 percent.

Of particular value to photoengravers, phototypesetters and makers of deep-etch plates, Clear Back Ortho offers these advantages: makes lateral reversal negatives in the camera in one step; because of special surface and flexibility, conforms to all flat, curved and wrap-around plates; makes first-step camera negatives for deep-etch process; is free from static build-up, and, can be easily spotted or retouched. The company states Clear Back is well-suited for use in phototypesetting machines and in making properly oriented camera negatives for exposure on "Dycril" photopolymer printing plates.

Names in the News

H. Myrl Stearns, President of Varian Associates, has been elected a Fellow of the American Association for the Advancement of Science.

Louis P. Clark, a Vice President of Radiation, Inc., has been appointed Manager of the Florida Division of Radiation.

Sidney Weiser has been named Director of Engineering for USI Robodyne, a division of U. S. Industries, Inc. Mr. Weiser was Chief Engineer at USI Robodyne.

R. C. Fuller has been elected Vice President and Group Executive of Bendix Aviation Corp. Mr. Fuller will continue to serve as General Manager of Bendix Pacific Division and in addition will supervise Bendix Computer Division and Bendix West Coast marine activities.

Maj. Gen. Harry Reichelderfer, USA (Ret.) has been named Administrative Vice President of Southwest Research Institute. General Reichelderfer previously was Assistant Director.

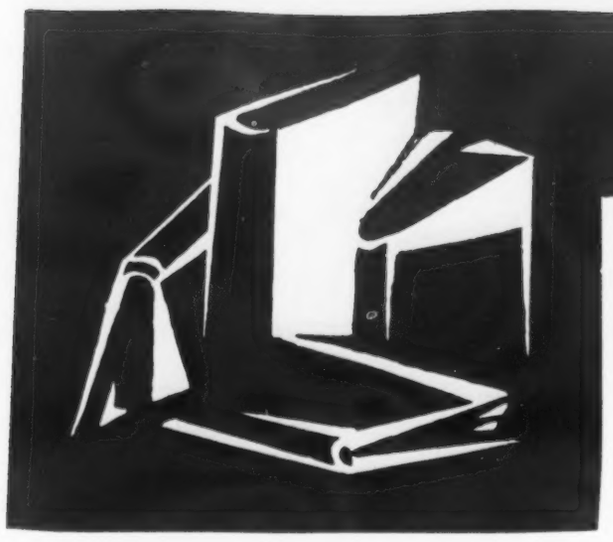
Larry Schwartz has been named Chief Engineer of Glenair, Inc. Mr. Schwartz was Experimental Engineer with Cannon Electric before joining Glenair.

Roland C. Davies, Editor and Publisher of *Telecommunications Reports*, successfully underwent an operation recently.

W. M. McFarland, Executive Vice President and Director of Hazeltine Corp., has been elected President of Hazeltine Technical Development Center, Inc., and **D. M. Stuart**, former head of the Federal Aviation Agency's Test Development and Evaluation Center, has been elected Vice President and General Manager. **Jennings B. Dow**, Director and President of Hazeltine's Electronics Division, is the new President of Hazeltine Research Corp.

Arthur R. Cristie has been named Manager of The Martin Co. Since 1958 Mr. Cristie has been a management consultant.

Paul V. Galvin, Chairman of the Board of Motorola Inc., died recently. Mr. Galvin founded the Galvin Manufacturing Co. in 1928. The company marketed the Motorola car radio and later took Motorola as its company name.



Books

PHOTOGRAPHY FOR EVERYONE, by Fritz Henle with H. M. Kinzer. The Viking Press, New York, 1959. 147 pages, $4.95.

Fritz Henle has free-lanced for a good many American and European magazines. A major part of his success as a photographer, as is that of any photographer, is due to an ability to come up with pictures having universal appeal. This ability stems from an innate interest in and respect for the human qualities which are evident in us all yet frequently masked by a thin coat of superficial modernity.

Mr. Henle discusses what people like about a good picture; what makes pictures good; how to approach the subject; how to photograph children; pictures of special interests; making a picture story; pictures at night; when to use a flash unit; camera techniques; what camera to buy; one-minute pictures; color pictures and home movies.

Reproductions of 127 photographs, 5 in color, are integrated with the text to show the reader how Mr. Henle carries out his own suggestions.

The book may be described as one for the person primarily interested in the end-product of photography,—the picture. The author has eliminated the technical discussion found in books designed for the professional and serious amateur photographers who are interested usually in the camera, how it works, lenses, chemicals and all the technical aspects of the photography process. Busy parents who want good pictures of their children, the hobbyist and vacationer will find this book of particular value.

COMMAND DECISIONS, by the Office of the Chief of Military History, Department of the Army. Harcourt, Brace and Company, N. Y., 1959. 481 pages, $5.95.

In this book twenty crucial and controversial decisions of World War II are examined by a selected group of professional historians.

The authors do not speculate about events of the war and offer little interpretation of them. The publication is a compilation of facts extracted from official military documents and combat records. The only opinions to be found are those inherent in the facts presented. As a consequence, the historians who have contributed to the book have produced a frank and objective view of important events in World War II and of the complex motivations and factors that go into the intricate process of military decision-making. It is not, however, and is not intended to be, a comprehensive history of the war; naval campaigns and air battles play only an incidental part of these pages.

The great decisions deal with many of the echelons of command—the decisions of chiefs of state on grand strategy; the decisions of theater commanders; the decisions of general staffs and combined chiefs of staff; the decisions of corps commanders; and, with decisions made by our enemies. Earl F. Ziemke has contributed, "The German Decision to Invade Norway and Denmark;" Louis Morton, "The Decision to Withdraw to Bataan," "The Basic Concept of Allied Strategy in World War II," "The Decision to Use the Atomic Bomb" and "Japan's Decision for War." Also included are, "General Clark's Decision to Drive on Rome," by Sidney T. Mathews; "OVERLORD versus the Mediterranean at the Cairo-Tehran Conferences," by Richard M. Leighton and "The Decision to Halt at the Elbe," by Forrest C. Pogue.

THE MILITARY LEGACY OF THE CIVIL WAR: THE EUROPEAN INHERITANCE, by Jay Luvaas. The University of Chicago Press, Chicago, 1959. 253 pages, $5.95.

The Civil War was a total war, the first since the days of Napoleon, and the first great war to be fought with the tools and weapons of the Industrial Revolution. European military observers, primarily Prussian, British and French, traveled to America to witness the War between the States. Each of the major European powers had reasons for interest in military affairs. Besides providing a testing ground for new weapons, the Civil War was a war of improvisation since equipment, strategy and logistics had to be adapted to fit unique conditions. The enormous distances involved, for example, led to the first military use of railroads. The long-range breech loading rifles and artillery made orthodox column formations and cavalry shock tactics no longer feasible; such weapons created the need for increased mobility, the strategy of the "indirect approach," the extensive use of mounted infantry and the elaboration of intrenchments for defense.

Here is a thorough account of these observers, of why they came to view the American campaigns, of what they wrote, of what their armies learned from the reports, and, ultimately, of the military influence of the Civil War on subsequent warfare and on later European military theorists.

"We have looked at the Civil War through everything except a foreign soldier's binoculars," writes Jay Luvaas, "and through those binoculars the view is different. We may know a great deal about Gettysburg, but we have not yet watched the battle beside the Prussian Major Justus Scheibert or followed a French military team through the Wilderness."

FREQUENCY RESPONSE FOR PROCESS CONTROL, edited by Wm. I. Caldwell, Geraldine A. Coon and Leslie M. Zoss. McGraw-Hill Book Company, Inc., New York, 1959. 400 pages, $11.50.

Fundamental methods of frequency response and their application to the analysis, testing and design of process control systems are presented in this book.

Distance-velocity lag, linear lag, and stability considerations are given careful attention in the theory section of the book. Methods of analysis are presented, with emphasis on the damped response method. The coverage of controller responses includes control charts for a variety of responses. Results are shown for variation of process and controller parameters. Closed-loop performances are explained and disturbances are discussed with regard to their magnitude and location in the control loop.

These fundamentals are applied to actual process control problems. Methods for calculating system time constants are given, along with useful material on the presentation of data and the dynamics of temperature measurement. Practical material is provided on pneumatic transmission lines. The discussion of cascaded systems includes a method for evaluating performance. The book also includes a technique for converting from step to frequency response using a desk calculator.

Personnel & Positions Available

As a service to AFCEA members, SIGNAL will make space available in this column for those members who are interested in employment in the communications, electronics and photography industries. Any member is entitled to three insertions in the magazine on a space available basis, free of charge. Please limit your notice to 5 lines. In replying, employers are asked to address: Box ....., SIGNAL, 1624 Eye St., N.W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

FIELD REPRESENTATIVE with thorough knowledge of government procurement practices with respect to R&D and production contracts in communications and electronics. Presently employed in eastern area, desires to relocate in Florida. Box 150.

COL. USAFR, TRIAL ATTORNEY before Armed Services Board of Contract Appeals desires legal or executive position with national corporation engaged in defense work; earlier 14 years general and corporate practice. Former Legal Advisor, Signal Corp. Midwestern Regional Office. Box 151.

WASHINGTON REPRESENTATIVE with several years experience handling both field and contractural problems. Familiar with research and development and production work in the communications-electronics field. Four years at present company. Box 152.

LIAISON REPRESENTATIVE FIRM desires to assist companies with Government business by acting as their Washington representative. Box 153.

PUBLIC RELATIONS ELECTRONICS CONSULTANT available to do special work ranging from single projects to planning complete programs. Experience with electronics trade press. Based in New York City. Box 154.

Industry Positions

This space will be available each month to Sustaining and Group Members of AFCEA who wish to state personnel needs. Persons interested should reply directly to company.

SECTION HEAD, COMMUNICATIONS (039-231-053A): To direct a group responsible for the conception of satellite and space communications systems; requires 6 to 10 years' single side band, scatter propagation, advanced modulation techniques, information theory; B.S.E.E. minimum; advanced degree preferred; U. S. citizen; occasional travel; salary to $15,000. Indicate position number and submit resume to: Technical Personnel Dept., Stromberg-Carlson, Electronics Center. Rochester 3, New York.

ENGINEER I (099-313-126B): To design audio and/or communications circuits. Will have project responsibility for packaged electronic designs. B.S. in E.E. preferred with 4 years' experience in transistor and general electronic circuit design. Salary: to $9,500.

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The system being supplied to Convair for the ATLAS Program includes a console and four rack cabinets providing both analog and discrete test functions with a resulting printed and GO-NO GO indication. As a product of RCA's Missile Electronics and Controls Department, Burlington, Massachusetts, APCHE is one of the latest RCA developments in the field of military weapon readiness equipments.

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George at the Forge

The day the mobile radar was delivered to Washington at Valley Forge, it was so cold a man's shadow froze to the ground. Nevertheless, the Father of his Country managed to work up a good head of steam when he saw the unit.

*"Idiots!" he stormed. "Why do they send me radar when we need food and shelter and clothing? What good is it? Does it have Bomac tubes?"**

"No sir," his orderly shivered. "It doesn't seem to have any tubes at all. But it might make a nice warm fire."

"I was thinking the same," Washington said. And, without another word, he went and got a little hatchet and chopped and chopped. The wind blew and the chips flew. Soon, the installation was reduced to kindling.

"That's more like it," the General said when he was done. "Now, if someone will hand me a match . . ."

But he never finished the sentence. The ice on which he was standing suddenly gave way, and he disappeared into the frigid water.

"General, general are you all right?" the orderly asked as he fished him out.

"I'm afraid so," Washington said. "But you'd better put a sign here to warn the others."

So, that was why the famous sign was put up — the sign you can see today when you visit Valley Forge. You know the one.

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